AFRL NM STEM Academy
Middle School Standards Alignment
for Fall TECH Mission (Rockets)

			Intro to Model Rocketry	Model Rocket Construction	RockSim Modeling & Simulation	Using GPS Units	Straw Rocket Challenge	Model Rocket Final Assembly & Inspection	Model Rocket Launch	Model Rocket Recovery	Model Rocket Data Collection	Model Rocket Dis-assembly	Model Rocket Data Analysis	Forces & Motion	Newton's Laws of Motion	Egg-Drop Challenge
			Day 1					**Day 2**					**Day 3**			
Common Core Standards for English Language Arts (Grades 6-8)																
Reading Standards for Informational Text																
	Craft and Structure															
Grade 6	4.	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.	X		X	X			X		X		X	X		
Grade 7	4.	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.	X		X	X			X		X		X	X		
Grade 8	4.	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.	X		X	X			X		X		X	X		
Speaking and Listening Standards																
	Comprehension and Collaboration															
Grade 6	1.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on *grade 6 topics and texts* , building on others' ideas and expressing their own clearly.	X				X						X			X
		a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issues to probe and reflect on ideas under discussion.					X									X
		b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.					X									X
		c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.					X									X
Grade 7	1.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on *grade 7 topics, texts, and issues,* building on others' ideas and expressing their own clearly.	X				X						X			X
		a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.					X						X			X
		b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.	X				X						X			X
		c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.	X				X						X			X
Grade 8	1.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly.	X				X						X			X
		a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.					X									X
		b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.	X				X									X
		c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant observations and ideas.	X				X									X
		d. Acknowledge new information expressed by others and, when warranted, qualify or justify their own views in light of the evidence presented.					X									X
	2.	Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.					X									X
	Presentation of Knowledge and Ideas															
Grade 6	4.	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.			X	X	X		X		X		X	X	X	X

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Grade 7	4.	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, fact, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.			X	X	X		X		X		X	X	X	X
Grade 8	4.	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.			X	X	X		X		X		X	X	X	X
Language Standards																
	Conventions of Standard English															
Grade 6	1.	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.		X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Ensure that pronouns are in the proper case (subjective, objective, possessive).		X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Use intensive pronouns (e.g., *myself, ourselves*).		X	X	X	X	X	X	X	X	X	X	X	X	X
	2.	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.			X	X	X				X		X	X	X	X
		a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.*			X	X	X				X		X	X	X	X
		b. Spell correctly.			X	X	X				X		X	X	X	X
Grade 7	2.	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.			X	X	X				X		X	X	X	X
		a. Us a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt*).			X	X	X				X		X	X	X	X
		b. Spell correctly.			X	X	X				X		X	X	X	X
Grade 8	2.	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.			X	X	X				X		X	X	X	X
		c. Spell correctly.			X	X	X				X		X	X	X	X
	Vocabulary Acquisition and Use															
Grade 6	4.	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 6 reading and content* , choosing flexibly from a range of strategies.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	5.	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Use the relationship between particular words (e.g., cause/effect, part/whole, item/category) to better understand each of the words.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	6.	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 7	4.	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 7 reading and content* , choosing flexibly from a range of strategies.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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	5.	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	6.	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 8	4.	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 8 reading and content* , choosing flexibly from a range of strategies.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	5.	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Interpret figures of speech (e.g., verbal irony, puns) in context.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Use the relationship between particular words to better understand each of the words.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	6.	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reading Standards for Literacy in Science and Technical Subjects																
	Key Ideas and Details															
Grades 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.	X		X	X	X						X			
	3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.		X	X	X	X	X	X	X	X	X		X	X	X
	Craft and Structure															
Grades 6-8	4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics* .	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Integration of Knowledge and Ideas															
Grades 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).			X						X		X	X	X	X
	Range of Reading and Level of Text Complexity															
Grades 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.		X	X	X					X			X	X	

Common Core Standards for Mathematics (Grades 6-8)

Mathematical Practices																
1.	Make sense of problems and persevere in solving them.			X		X							X	X	X
2.	Reason abstractly and quantitatively.			X	X	X				X		X	X	X	X
3.	Construct viable argument and critique the reasoning of others.											X			
5.	Use appropriate tools strategically.				X	X							X	X	X
7.	Look for and make use of structure.			X	X	X	X			X		X	X	X	X

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Ratios and Proportional Relationships																
Grade 6	•	**Understand ratio concepts and use ratio reasoning to solve problems**														
	2.	Understand the concept of a unit rate *a/b* associated with a ratio *a:b* with *b'0* , and use rate language in the context of a ratio relationship. For example, "*This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*					X									X
	3.	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.												X	X	X
		d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.												X	X	X
Grade 7	•	**Analyze proportional relationships and use them to solve real-world and mathematical problems.**														
	1.	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, computer the unit rate as the complex fraction ½ / ¼ miles per hour, equivalently 2 miles per hour.*														X
	2.	Recognize and represent proportional relationships between quantities.											X			X
		c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.*														X
		d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points *(0,0)* and *(1,r)* where *r* is the unit rate.											X			
The Number System																
Grade 7	•	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**														
	1.	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.											X			X
		d. Apply properties of operations as strategies to add and subtract rational numbers.											X			X
Grade 8	•	**Understand the connections between proportional relationships, lines, and linear equations.**														
	5.	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*					X						X			
	6.	Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation *y = mx* for a line through the origin and the equation *y = mx + b* for a line intercepting the vertical axis at *b* .					X						X			
Expressions and Equations																
Grade 6	•	**Apply and extend previous understandings of arithmetic to algebraic expressions.**														
	2.	Write, read, and evaluate expressions in which letters stand for numbers.													X	X
		a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 - y.*											X		X	X
	7.	Solve real-world and mathematical problems by writing and solving equations of the form *x + p = q* and *px = q* for cases in which *p, q* and *x* are all nonnegative rational numbers.											X			X
Grade 6	•	**Represent and analyze quantitative relationships between dependent and independent variables.**														
	9.	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*												X		X

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Grade 7	◆	**Solve real-life and mathematical problems using numerical and algebraic expressions and equations.**														
	3.	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*												X		X
	4.	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.											X	X		X
		a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*											X	X		X
Functions																
Grade 8	◆	**Define, evaluate, and compare functions.**														
	1.	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.											X			
Grade 8	◆	**Use functions to model relationships between quantities.**														
	4.	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two *(x, y)* values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.											X			
	5.	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.											X			

Next Generation Science Standards (Grades 6-8)

Performance Expectations

Physical Science

MS-PS2		**Motion and Stability: Forces and Interactions**														
	1.	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	X	X	X		X		X					X	X	X
	2.	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	X	X	X		X		X					X	X	X
	4.	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.												X		
	Disciplinary Core Ideas															
	PS2.A: Forces and Motion															
	◆	For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)	X	X	X		X		X					X	X	X
	◆	The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)	X	X	X		X		X					X	X	X
	◆	All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MSPS2-2)	X	X	X		X		X					X	X	X
	PS2.B: Types of Interactions															
	◆	Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)												X		

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MS-PS3	**Energy**															
	2.	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	X													
	3.	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* (*Integrates traditional science content with engineering through a Practice or Disciplinary Core Idea.)	X	X				X	X	X	X					
	5.	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	X													X
	Disciplinary Core Ideas															
	PS3.A: Definitions of Energy															
	•	Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)														X
	•	A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)														X
	PS3.B: Conservation of Energy and Energy Transfer															
	•	Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)							X							
	PS3.C: Relationship Between Energy and Forces															
	•	When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)												X	X	X
	ETS1.A: Defining and Delimiting an Engineering Problem															
	•	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3)			X		X		X							X
	ETS1.B: Developing Possible Solutions															
	•	A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)					X									X
Earth and Space Science																
MS-ESS1	**Earth's Place in the Universe**															
	2.	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.												X	X	
	Disciplinary Core Ideas															
	ESS1.B: Earth and the Solar System															
	•	The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)												X	X	
Engineering Design																
MS-ETS1	**Engineering Design**															
	1.	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	X	X	X		X	X	X	X	X	X	X	X	X	X
	2.	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	X	X	X		X						X	X	X	X
	3.	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	X	X	X		X			X	X	X	X	X	X	X
	4.	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.		X	X	X	X	X	X	X	X	X	X	X	X	X

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	Disciplinary Core Ideas															
	ETS1.A: Defining and Delimiting Engineering Problems															
	•	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)			X		X		X							X
	ETS1.B: Developing Possible Solutions															
	•	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)		X	X	X	X	X	X	X	X	X	X	X	X	X
	•	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)		X	X		X		X							X
	•	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)			X		X		X							X
	•	Models of all kinds are important for testing solutions. (MS-ETS1-4)			X		X		X					X	X	X
	ETS1.C: Optimizing the Design Solution															
	•	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)			X		X		X							X
	•	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4)			X		X		X							X
Science and Engineering Practices																
Engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice.																
	1.	Asking questions (for science) and defining problems (for engineering)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.	Developing and using models	X		X		X						X	X	X	X
	3.	Planning and carrying out investigations	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	4.	Analyzing and interpreting data			X	X	X				X		X	X	X	X
	5.	Using mathematics and computational thinking	X	X	X	X	X			X	X	X	X	X	X	X
	6.	Constructing explanations (for science) and designing solutions (for engineering)	X		X		X						X	X	X	X
	7.	Engaging in argument from evidence					X						X	X	X	X
	8.	Obtaining, evaluating, and communicating information		X	X	X	X		X	X	X	X	X	X	X	X
Cross Cutting Concepts																
Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.																
•		Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.			X	X	X	X	X	X	X	X	X	X	X	X
•		Patterns can be used to identify cause and effect relationships.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
•		Graphs, charts, and images can be used to identify patterns in data.					X						X			

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		Day 1					**Day 2**					**Day 3**			
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.															
◆	Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.	X		X		X	X	X	X	X	X	X	X	X	X
◆	Cause and effect relationships may be used to predict phenomena in natural or designed systems.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
◆	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.												X	X	X
Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.															
◆	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.				X								X	X	
◆	The observed function of natural and designed systems may change with scale.	X	X	X											
◆	Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.									X		X	X	X	X
◆	Scientific relationships can be represented through the use of algebraic expressions and equations.	X		X						X		X	X	X	X
◆	Phenomena that can be observed at one scale may not be observable at another scale.	X	X	X	X	X	X	X	X	X	X	X	X	X	
Systems and System Models: A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.															
◆	Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
◆	Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.	X	X	X		X	X	X	X	X	X	X	X	X	X
◆	Models are limited in that they only represent certain aspects of the system under study.	X		X	X	X									
Energy and Matter: Flows, Cycles, and Conservation: Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.															
◆	Matter is conserved because atoms are conserved in physical and chemical processes.	X													
◆	Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.	X	X	X			X	X	X	X	X	X			
◆	Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).	X	X				X	X	X	X	X	X	X	X	X
◆	The transfer of energy can be tracked as energy flows through a designed or natural system.	X	X				X	X	X	X	X	X			
Structure and Function: The way an object is shaped or structured determines many of its properties and functions.															
◆	Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
◆	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	X	X			X	X	X	X	X	X				X
Stability and Change: For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.															
◆	Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.	X	X	X		X	X	X	X	X	X	X	X	X	X

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◆	Small changes in one part of a system might cause large changes in another part.	X	X	X		X	X	X	X	X	X	X	X	X	X
◆	Stability might be disturbed either by sudden events or gradual changes that accumulate over time.	X	X	X		X	X	X	X	X	X	X	X	X	X
◆	Systems in dynamic equilibrium are stable due to a balance of feedback mechanisms.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Computer Science Standards (Grades 6-8)															
Data and Analysis															
2-DA-08	Collect data using computational tools and transform the data to make it more useful and reliable.			X	X										
International Society for Technology Education Standards															
Knowledge Constructor															
	◆ **Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.**														
	3b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources.			X										X	
Innovative Designer															
	◆ **Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources**														
	4a Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.			X											
	4b Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.			X											
	4c Students develop, test and refine prototypes as part of a cyclical design process.			X											
Computational Thinker															
	◆ **Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.**														
	5a Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.			X											
	5b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.			X										X	
	5c Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.			X											
Creative Communicator															
	◆ **Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.**														
	6c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.			X										X	