DesCartes (Combined)

Subject: Concepts and Processes Goal: Connections; Nature of Science

Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: Below 171

Skills and Concepts to Develop Below 171	Skills and Concepts to Introduce 171 - 180
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
• Recognizes examples of systems (term not used) and their parts*	 Describes the part that is missing from a diagram of a real-life system* Selects the part that will turn a specific collection of components into a system* Describes the component(s) of a given system that perform(s) a given role* Orders objects and events
Evidence, Models and Explanations	Evidence, Models and Explanations
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
	 Describes ways in which things can change Describes variables that cause change* Identifies qualitative change in systems, given the conditions that occur before, during, and after an event* Predicts what comes next in sequences of objects or events Describes the sequence of elements within a pattern* Determines causes for a given effect Predicts effects of a particular action
Nature of Science	Nature of Science
Science and Technology; Personal-Social Issues	 Science and Technology; Personal-Social Issues Explains how new tools and technologies affect the way we view the world*
New Vocabulary: none	<i>New Vocabulary:</i> cause, change, interaction, science, technology, variable
New Signs and Symbols: none	New Signs and Symbols: ¢ cent sign

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 171 - 180

Skills and Concepts to Enhance Below 171	Skills and Concepts to Develop 171 - 180	Skills and Concepts to Introduce 181 - 190
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
• Recognizes examples of systems (term not used) and their parts*	 Describes the part that is missing from a diagram of a real-life system* Selects the part that will turn a specific collection of components into a system* Describes the component(s) of a given system that perform(s) a given role* Orders objects and events 	 Understands that each part of a system (term not used) has a different function* Infers the part of a given system that has been removed* Orders steps of familiar procedures* Orders objects to show levels of organization (simple to complex)*
Evidence, Models and Explanations	Evidence, Models and Explanations	Evidence, Models and Explanations
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
	 Describes ways in which things can change Describes variables that cause change* Identifies qualitative change in systems, given the conditions that occur before, during, and after an event* Predicts what comes next in sequences of objects or events Describes the sequence of elements within a pattern* Determines causes for a given effect Predicts effects of a particular action 	 Describes changes that have occurred in a system* Explains what caused a particular change in a common system to occur* Predicts the next step for a given cycle (term not used)* Determines causes for a given effect Predicts effects of a particular action
Nature of Science	Nature of Science	Nature of Science
		 Explains why it is important for scientific observations to be accurate* Recognizes that results differ slightly when an experiment is repeated in a different place, at a different time, or by a different person, but the general evidence gathered in an experiment should be replicable by anyone, anywhere* Recognizes that the purpose of scientific inquiry is to better understand the natural world Describes how theories are developed* Recognizes that scientific theories depend on evidence*
Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
	• Explains how new tools and technologies affect the way we view the world*	

New Vocabulary: none	New Vocabulary: cause, change, interaction, science,	New Vocabulary: accurate, data, experiment,
	technology, variable	measurement, reason, scientific theory, scientist
New Signs and Symbols: none	New Signs and Symbols: ¢ cent sign	New Signs and Symbols: none

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 181 - 190

Skills and Concepts to Enhance 171 - 180	Skills and Concepts to Develop 181 - 190	Skills and Concepts to Introduce 191 - 200
 System, Order, Organization, Interactions; Form Describes the part that is missing from a diagram of a real-life system* Selects the part that will turn a specific collection of components into a system* Describes the component(s) of a given system that perform(s) a given role* Orders objects and events 	 System, Order, Organization, Interactions; Form Understands that each part of a system (term not used) has a different function* Infers the part of a given system that has been removed* Orders steps of familiar procedures* Orders objects to show levels of organization (simple to complex)* 	 System, Order, Organization, Interactions; Form Describes characteristics used to order data shown in tables* Orders steps of familiar procedures* Understands that when components of systems interact, change occurs Gives examples of interacting components*
Evidence, Models and Explanations	Evidence, Models and Explanations	 Evidence, Models and Explanations Recognizes that models are useful to illustrate processes that are too large to manipulate* Selects models to represent the parts of an object or process* Explains that models are useful to examine things or processes which cannot be directly observed or tested Compares physical models to what they represent*
 Evolution, Equilibrium and Energy Describes ways in which things can change Describes variables that cause change* Identifies qualitative change in systems, given the conditions that occur before, during, and after an event* Predicts what comes next in sequences of objects or events Describes the sequence of elements within a pattern* Determines causes for a given effect Predicts effects of a particular action 	 Evolution, Equilibrium and Energy Describes changes that have occurred in a system* Explains what caused a particular change in a common system to occur* Predicts the next step for a given cycle (term not used)* Determines causes for a given effect Predicts effects of a particular action 	 Evolution, Equilibrium and Energy Gives examples of events that are likely to cause disequilibrium in a system (terms not used)* Describes a constant rate of change for a familiar system* Describes changes that have occurred in a system* Classifies events as change* Explains what caused a particular change in a common system to occur* Describes the importance of direct observation in determining the cause of change to systems* Gives real life examples of things that remain constant Infers what is missing in sequences of patterns or events* Extends patterns found in nature* Predicts what comes next in a sequence of numbers showing a complex pattern (e.g., addition then subtraction, geometric progression) Gives examples of cycles Understands that patterns that recur regularly are

		 called cycles Infers what step is missing from a cycle showing repetitive change* Understands that a cycle may have no beginning or end, but events within the cycle will proceed in a predictable fashion* Understands that recognizing an event is cyclic can help us prepare for the future* Gives examples of a cause and effect relationship Explains how determining cause and effect relationships can be useful* Classifies a given scenario as an example of cause and effect Infers the possible causes for a given scenario (presented as a diagram)*
Nature of Science	 Ncture of Science Explains why it is important for scientific observations to be accurate* Recognizes that results differ slightly when an experiment is repeated in a different place, at a different time, or by a different person, but the general evidence gathered in an experiment should be replicable by anyone, anywhere* Recognizes that the purpose of scientific inquiry is to better understand the natural world Describes how theories are developed* Recognizes that scientific theories depend on evidence* 	 Ncture of Science Recognizes that repeating an experiment many times may increase the reliability of the data collected* Understands that scientists make the results of investigations public so that others can replicate their work* Recognizes that the accuracy of observations is improved by repeating the observations several times, and by having others replicate results* Recognizes that repeating an observation many times produces data of high quality and accuracy* Explains why an observation must yield consistent, repeated results to be considered accurate* Explains why a scientific investigation will work the same way in different places* Recognizes that direct observations allow a phenomenon to be confirmed whereas inference and relying on others' opinions do not allow a phenomenon to be confirmed * Describes the criteria used to establish scientific laws and theories* Recognizes that a key part of the scientific process is accurate communication of procedures and results to others*

Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
• Explains how new tools and technologies affect the way		• Uses technology in scientific investigations to gather
we view the world*		accurate data*
New Vocabulary: cause, change, interaction, science,	New Vocabulary: accurate, data, experiment,	New Vocabulary: cause and effect relationship,
technology, variable	measurement, reason, scientific theory, scientist	composition, condition, cyclic pattern, evidence, exert,
		experimental result, field, gradient, hypothesis,
		imbalance, interact, mechanism, prediction,
		quantification, regular pattern, scientific law, scientific
		model, series, slope, speed, test, trial
New Signs and Symbols: ¢ cent sign	New Signs and Symbols: none	New Signs and Symbols: C Celsius, ° degrees

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 191 - 200

Skills and Concepts to Enhance 181 - 190	Skills and Concepts to Develop 191 - 200	Skills and Concepts to Introduce 201 - 210
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
 Understands that each part of a system (term not used) has a different function* Infers the part of a given system that has been removed* Orders steps of familiar procedures* Orders objects to show levels of organization (simple to complex)* 	 Describes characteristics used to order data shown in tables* Orders steps of familiar procedures* Understands that when components of systems interact, change occurs Gives examples of interacting components* 	 Explains why an object or collection of objects is a system Classifies an example of parts that work together as a system* Describes characteristics used to order sets of objects or events Compares characteristics used to order sets of objects or events* Understands that when components of systems interact, change occurs Understands that interaction may occur across a distance, without components physically touching*
Evidence, Models and Explanations	Evidence, Models and Explanations	Evidence, Models and Explanations
	 Recognizes that models are useful to illustrate processes that are too large to manipulate* Selects models to represent the parts of an object or process* Explains that models are useful to examine things or processes which cannot be directly observed or tested Compares physical models to what they represent* 	 Recognizes that models are not identical to the object, process, or event they portray* Determines which model would be most useful in describing a particular process, event, or concept* Orders the stages that are involved in creating a scientific model*
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
 Describes changes that have occurred in a system* Explains what caused a particular change in a common system to occur* Predicts the next step for a given cycle (term not used)* Determines causes for a given effect Predicts effects of a particular action 	 Gives examples of events that are likely to cause disequilibrium in a system (terms not used)* Describes a constant rate of change for a familiar system* Describes changes that have occurred in a system* Classifies events as change* Explains what caused a particular change in a common system to occur* Describes the importance of direct observation in determining the cause of change to systems* Gives real life examples of things that remain constant Infers what is missing in sequences of patterns or events* Extends patterns found in nature* 	 Gives examples of equilibrium in systems Classifies a given event as an example of equilibrium Understands that counterbalancing changes may be needed for systems to be maintained as conditions change Explains how systems remain in equilibrium Predicts how a particular change will affect the equilibrium of a system* Gives examples of events that are likely to cause disequilibrium in a system (terms not used)* Explains that very fast and very slow changes can be difficult to see or measure* Represents change quantitatively* Explains that change in nature is common and

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	 Predicts what comes next in a sequence of numbers showing a complex pattern (e.g., addition then subtraction, geometric progression) Gives examples of cycles Understands that patterns that recur regularly are called cycles Infers what step is missing from a cycle showing repetitive change* Understands that a cycle may have no beginning or end, but events within the cycle will proceed in a predictable fashion* Understands that recognizing an event is cyclic can help us prepare for the future* Gives examples of a cause and effect relationship Explains how determining cause and effect relationships can be useful* Classifies a given scenario as an example of cause and effect Infers the possible causes for a given scenario (presented as a diagram)* 	 widespread* Classifies events as change* Describes properties of matter that remain constant after changes to systems Determines the rate or gradient of change in systems, when given length of time and a total measurement of change* Determines the location or time that a particular change is likely to occur when given the rate of change to a system* Predicts what comes next in a sequence of numbers showing a complex pattern (e.g., addition then subtraction, geometric progression) Gives evidence that supports the conclusion that a system (man-made or natural) has changed or evolved over time Understands that evolution refers to changes to an entire species, not changes to an individual* Describes characteristics of evolution Makes inferences about the evolution of a system, given data about that system Interprets data (diagrams) related to the evolution of a system* Understands that rates describe the time it takes for a unit of a given event to occur* Analyzes changes in scale
Nature of Science	Nature of Science	Nature of Science
 Explains why it is important for scientific observations to be accurate* Recognizes that results differ slightly when an experiment is repeated in a different place, at a different time, or by a different person, but the general evidence gathered in an experiment should be replicable by anyone, anywhere* Recognizes that the purpose of scientific inquiry is to better understand the natural world Describes how theories are developed* Recognizes that scientific theories depend on evidence* 	 Recognizes that repeating an experiment many times may increase the reliability of the data collected* Understands that scientists make the results of investigations public so that others can replicate their work* Recognizes that the accuracy of observations is improved by repeating the observations several times, and by having others replicate results* Recognizes that repeating an observation many times produces data of high quality and accuracy* Explains why an observation must yield consistent, repeated results to be considered accurate* Explains why a scientific investigation will work the same way in different places* Recognizes that direct observations allow a 	 Understands that when a scientific test is repeated using the same conditions, similar results usually occur* Recognizes that repeating an experiment many times may increase the reliability of the data collected* Explains why an observation must yield consistent, repeated results to be considered accurate* Explains why a scientific investigation will work the same way in different places* Recognizes that scientific ideas are tentative and therefore subject to change* Explains that as scientific knowledge increases, scientific ideas are subject to change Understands that scientific knowledge is incomplete, and room exists for advancement in our understanding Describes how scientific knowledge is modified as new information challenges previously held theories

	 phenomenon to be confirmed whereas inference and relying on others' opinions do not allow a phenomenon to be confirmed* Describes the criteria used to establish scientific laws and theories* Understands that a key part of the scientific process is accurate communication of procedures and results to others* Recognizes that scientific explanations must be based on observations and scientific knowledge* 	 Recognizes that scientific understanding is produced through use of empirical standards (i.e., the use of direct observation and measurement)* Recognizes that direct observations allow a phenomenon to be confirmed whereas inference and relying on others' opinions do not allow a phenomenon to be confirmed* Understands that theories are based on multiple observations, concepts, principles, and historical perspective* Distinguishes examples of theories from facts, observations, hypotheses* Describes characteristics of theories Classifies a particular statement as an observation Distinguishes examples of observations from facts, theories, and hypotheses* Describes factors that produce biased data* Recognizes bias in scientific information* Explains that scientific theories depend on logically consistent arguments* Recognizes that scientific explanations must be based on observations and scientific knowledge*
Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
	• Uses technology in scientific investigations to gather accurate data*	 Explains how scientific knowledge and economics drive the development of technology* Explains that scientific advances often depend on development of new technologies*
<i>New Vocabulary:</i> accurate, data, experiment, measurement, reason, scientific theory, scientist	<i>New Vocabulary:</i> cause and effect relationship, composition, condition, cyclic pattern, evidence, exert, experimental result, field, gradient, hypothesis, imbalance, interact, mechanism, prediction, quantification, regular pattern, scientific law, scientific model, series, slope, speed, test, trial	<i>New Vocabulary:</i> accelerate, apparent size, arrangement, balance (equilibrium), claim, contact, discard, disequilibrium, double-pan balance, evaluate, evolution, evolutionary change, evolutionary trend, evolve, field of view, geologist, magnification power, material, observable, orderly, percentage, physical model, predictable, regular increase, reject, reversible, scale model, scaled up
New Signs and Symbols: none	New Signs and Symbols: C Celsius, ° degrees	<i>New Signs and Symbols:</i> ., . decimal point, ft feet, km kilometer/kilometre, %

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 201 - 210

Skills and Concepts to Enhance 191 - 200	Skills and Concepts to Develop 201 - 210	Skills and Concepts to Introduce 211 - 220
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
 Describes characteristics used to order data shown in tables* Orders steps of familiar procedures* Understands that when components of systems interact, change occurs Gives examples of interacting components* 	 Explains why an object or collection of objects is a system Classifies an example of parts that work together as a system* Describes characteristics used to order sets of objects or events Compares characteristics used to order sets of objects or events* Understands that when components of systems interact, change occurs Understands that interaction may occur across a distance, without components physically touching* 	 Classifies an example of parts that work together as a system* Understands that adding or removing components of systems will cause changes to those systems* Understands that interacting components of systems affect each other*
Evidence, Models and Explanations	Evidence, Models and Explanations	Evidence, Models and Explanations
 Recognizes that models are useful to illustrate processes that are too large to manipulate* Selects models to represent the parts of an object or process* Explains that models are useful to examine things or processes which cannot be directly observed or tested Compares physical models to what they represent* 	 Recognizes that models are not identical to the object, process, or event they portray* Determines which model would be most useful in describing a particular process, event, or concept* Orders the stages that are involved in creating a scientific model* 	 Explains how models help scientists to understand the physical world* Compares physical, mathematical, and conceptual models* Gives examples of conceptual (e.g., scientific) models Evaluates the usefulness of a model* Describes circumstances that might lead to the revision of a scientific model Orders the stages that are involved in creating a scientific model*
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
 Gives examples of events that are likely to cause disequilibrium in a system (terms not used)* Describes a constant rate of change for a familiar system* Describes changes that have occurred in a system* Classifies events as change* Explains what caused a particular change in a common system to occur* Describes the importance of direct observation in determining the cause of change to systems* Gives real life examples of things that remain constant 	 Gives examples of equilibrium in systems Classifies a given event as an example of equilibrium Understands that counterbalancing changes may be needed for systems to be maintained as conditions change Explains how systems remain in equilibrium Predicts how a particular change will affect the equilibrium of a system* Gives examples of events that are likely to cause disequilibrium in a system (terms not used)* Explains that very fast and very slow changes can be 	 Gives examples of equilibrium in systems Predicts how a particular change will affect the equilibrium of a system* Gives examples of systems which show balance* Analyzes changes occurring within systems* Gives examples of things in nature which do not change* Determines the rate or gradient of change in systems, when given length of time and a total measurement of change* Predicts patterns of change to systems*

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 Infers what is missing in sequences of patterns or events* Extends patterns found in nature* Predicts what comes next in a sequence of numbers showing a complex pattern (e.g., addition then subtraction, geometric progression) Gives examples of cycles Understands that patterns that recur regularly are called cycles Infers what step is missing from a cycle showing repetitive change* Understands that a cycle may have no beginning or end, but events within the cycle will proceed in a predictable fashion* Understands that recognizing an event is cyclic can help us prepare for the future* Gives examples of a cause and effect relationship Explains how determining cause and effect relationships can be useful* Classifies a given scenario as an example of cause and effect Infers the possible causes for a given scenario (presented as a diagram)* 	 difficult to see or measure* Represents change quantitatively* Explains that change in nature is common and widespread* Classifies events as change* Describes properties of matter that remain constant after changes to systems Determines the rate or gradient of change in systems, when given length of time and a total measurement of change* Determines the location or time that a particular change is likely to occur when given the rate of change to a system* Predicts what comes next in a sequence of numbers showing a complex pattern (e.g., addition then subtraction, geometric progression) Gives evidence that supports the conclusion that a system (man-made or natural) has changed or evolved over time Understands that evolution refers to changes to an entire species, not changes to an individual* Describes characteristics of evolution Makes inferences about the evolution of a system, given data about that system Interprets data (diagrams) related to the evolution of a system* 	 Extrapolates using rate of change to a system* Distinguishes cycles from non-cyclic events Understands that events that occur regularly are called cyclic* Understands that rates describe the time it takes for a unit of a given event to occur* Analyzes changes in scale Understands that correlations seen in data are most useful in making predictions when a cause-effect relationship is established*
	• Understands that rates describe the time it takes for a unit of a given event to occur*	
Nature of Science	Analyzes changes in scale Nature of Science	Nature of Science
Recognizes that repeating an experiment many times	Understands that when a scientific test is repeated	Understands that a key part of science is for scientists
may increase the reliability of the data collected*	using the same conditions, similar results usually	to confirm each other's findings*
 Understands that scientists make the results of investigations public so that others can replicate their work* 	 occur* Recognizes that repeating an experiment many times may increase the reliability of the data collected* 	• Understands that to replicate an experiment, the conditions of the experiment should be as similar to the original as possible
• Recognizes that the accuracy of observations is	• Explains why an observation must yield consistent,	• Understands that patterns and trends are easier to see
improved by repeating the observations several times, and by having others replicate results*	repeated results to be considered accurate*Explains why a scientific investigation will work the	when an experiment is repeated several times, multiple sets of data are collected, or data is averaged
• Recognizes that repeating an observation many times	same way in different places*	• Compares the results produced when an experiment is
produces data of high quality and accuracy*	• Recognizes that scientific ideas are tentative and	repeated several times*
• Explains why an observation must yield consistent, repeated results to be considered accurate*	therefore subject to change*Explains that as scientific knowledge increases,	• Recognizes that it can be difficult to determine the sources of error in an experiment*
 Explains why a scientific investigation will work the 	• Explains that as scientific knowledge increases, scientific ideas are subject to change	 Lists possible reasons for inconsistent results*
same way in different places*	 Understands that scientific knowledge is incomplete, 	Recognizes that a controlled experiment will produce

 Recognizes that science is limited to understanding the physical causes of the physical world* Recognizes that direct observations allow a phenomenon to be confirmed whereas inference and relying on others' opinions do not allow a phenomenon to be confirmed* Describes the criteria used to establish scientific laws and theories* Understands that a key part of the scientific process is accurate communication of procedures and results to others* Recognizes that scientific explanations must be based on observations and scientific knowledge* 	 and room exists for advancement in our understanding Describes how scientific knowledge is modified as new information challenges previously held theories Recognizes that scientific understanding is produced through use of empirical standards (i.e., the use of direct observation and measurement)* Recognizes that direct observations allow a phenomenon to be confirmed whereas inference and relying on others' opinions do not allow a phenomenon to be confirmed* Understands that theories are based on multiple observations, concepts, principles, and historical perspective* Distinguishes examples of theories from facts, observations, hypotheses* Describes characteristics of theories Classifies a particular statement as an observation Distinguishes examples of observations from facts, theories, and hypotheses* Describes factors that produce biased data* Recognizes bias in scientific information* Explains that scientific theories depend on logically consistent arguments* Recognizes that scientific knowledge* 	 reproducible results* Compares controlled and uncontrolled experiments in terms of the consistency of data produced* Recognizes that science changes as new theories and evidence arise* Explains that scientific knowledge is tentative and therefore subject to change as new evidence is uncovered* Gives examples of changes in scientific knowledge that have resulted from the appearance of new evidence* Recognizes that when data is incomplete, great opportunity for advancement exists* Recognizes that when little understanding of an area exists, scientists may interpret data and theory differently* Explains that scientists investigate for many differing reasons, but the ultimate purpose is to understand the natural world* Describes characteristics of scientific thinking* Recognizes that reasoning can be distorted by strong emotions* Defines scientific theory* Contrasts the terms hypothesis, theory, principle, law, model, and paradigm as used by scientists* Classifies a particular scientific explanation as a theory* Distinguishes examples of observations from facts, theories, and hypotheses* Classifies a particular statement as an hypothesis* Describes factors that produce biased data* Explains that scientific explanations limit themselves to natural causes for natural phenomena* Recognizes that a key assumption of science is that the universe is a vast, single system that operates according to a single, consistent set of rules* Recognizes that scientific explanations are considered valid when they meet multiple criteria (e.g., consistency with the evidence seen in nature, respect for the rules of evidence, openness to criticism, communication of methods used, public
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		 communication of results)* Explains that scientific theories depend on logically consistent arguments*
Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
 Uses technology in scientific investigations to gather accurate data* 	 Explains how scientific knowledge and economics drive the development of technology* Explains that scientific advances often depend on development of new technologies* 	 Applies the steps of technological design Compares and contrasts the procedures used in scientific inquiry and technological design*
<i>New Vocabulary:</i> cause and effect relationship, composition, condition, cyclic pattern, evidence, exert, experimental result, field, gradient, hypothesis, imbalance, interact, mechanism, prediction, quantification, regular pattern, scientific law, scientific model, series, slope, speed, test, trial	<i>New Vocabulary:</i> accelerate, apparent size, arrangement, balance (equilibrium), claim, contact, discard, disequilibrium, double-pan balance, evaluate, evolution, evolutionary change, evolutionary trend, evolve, field of view, geologist, magnification power, material, observable, orderly, percentage, physical model, predictable, regular increase, reject, reversible, scale model, scaled up	<i>New Vocabulary:</i> absolute knowledge, balance, coincidence, cyclic, cyclic phenomenon, episodic, inconclusive, indicate, number pattern, phenomena, regulated, repeat, replication, results, testable, vary
<i>New Signs and Symbols:</i> C Celsius, ° degrees	<i>New Signs and Symbols:</i> . , . decimal point, ft feet, km kilometer/kilometre, %	New Signs and Symbols: cubic centimeter/centimetre

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 211 - 220

Skills and Concepts to Enhance 201 - 210	Skills and Concepts to Develop 211 - 220	Skills and Concepts to Introduce 221 - 230
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
 Explains why an object or collection of objects is a system Classifies an example of parts that work together as a system* Describes characteristics used to order sets of objects or events Compares characteristics used to order sets of objects or events* Understands that when components of systems interact, change occurs Understands that interaction may occur across a distance, without components physically touching* 	 Classifies an example of parts that work together as a system* Understands that adding or removing components of systems will cause changes to those systems* Understands that interacting components of systems affect each other* 	• Gives examples of inputs and outputs of systems*
Evidence, Models and Explanations	Evidence, Models and Explanations	Evidence, Models and Explanations
 Recognizes that models are not identical to the object, process, or event they portray* Determines which model would be most useful in describing a particular process, event, or concept* Orders the stages that are involved in creating a scientific model* 	 Explains how models help scientists to understand the physical world* Compares physical, mathematical, and conceptual models* Gives examples of conceptual (e.g., scientific) models Evaluates the usefulness of a model* Describes circumstances that might lead to the revision of a scientific model Orders the stages that are involved in creating a scientific model* 	 Differentiates among examples of models and observations* Selects appropriate scale models to represent data* Assesses how well a model represents a real life event, process, or concept*
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
 Gives examples of equilibrium in systems Classifies a given event as an example of equilibrium Understands that counterbalancing changes may be needed for systems to be maintained as conditions change Explains how systems remain in equilibrium Predicts how a particular change will affect the equilibrium of a system* Gives examples of events that are likely to cause disequilibrium in a system (terms not used)* Explains that very fast and very slow changes can be 	 Gives examples of equilibrium in systems Predicts how a particular change will affect the equilibrium of a system* Gives examples of systems which show balance* Analyzes changes occurring within systems* Gives examples of things in nature which do not change* Determines the rate or gradient of change in systems, when given length of time and a total measurement of change* Predicts patterns of change to systems* 	 Explains that equilibrium can be produced when changes occur in opposition to each other and at the same time* Gives examples of maintenance of equilibrium (homeostasis) in the human body* Describes characteristics of a gradient* Gives examples of cyclic events* Determines evolutionary trends in Earth/space, physical, and biological systems*

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 difficult to see or measure* Represents change quantitatively* Explains that change in nature is common and widespread* Classifies events as change* Describes properties of matter that remain constant after changes to systems Determines the rate or gradient of change in systems, when given length of time and a total measurement of 	 Extrapolates using rate of change to a system* Distinguishes cycles from non-cyclic events Understands that events that occur regularly are called cyclic* Understands that rates describe the time it takes for a unit of a given event to occur* Analyzes changes in scale Understands that correlations seen in data are most 	
 change* Determines the location or time that a particular change is likely to occur when given the rate of change to a system* 	useful in making predictions when a cause-effect relationship is established*	
• Predicts what comes next in a sequence of numbers showing a complex pattern (e.g., addition then subtraction, geometric progression)		
• Gives evidence that supports the conclusion that a system (man-made or natural) has changed or evolved over time		
• Understands that evolution refers to changes to an		
 entire species, not changes to an individual* Describes characteristics of evolution 		
 Makes inferences about the evolution of a system, 		
given data about that system		
• Interprets data (diagrams) related to the evolution of a		
system*		
• Understands that rates describe the time it takes for a		
unit of a given event to occur*Analyzes changes in scale		
Nature of Science	Nature of Science	Nature of Science
Understands that when a scientific test is repeated	Understands that a key part of science is for scientists	Recognizes why it is important for scientific
using the same conditions, similar results usually occur*	 Understands that a key part of science is for scientists to confirm each other's findings* Understands that to replicate an experiment, the 	observations to be repeated before drawing conclusions*
• Recognizes that repeating an experiment many times may increase the reliability of the data collected*	conditions of the experiment should be as similar to the original as possible	• Recognizes why other scientists must be able to replicate results of an experiment*
• Explains why an observation must yield consistent, repeated results to be considered accurate*	• Understands that patterns and trends are easier to see when an experiment is repeated several times, multiple	 Recognizes that an idea must be tested multiple times before being accepted or rejected*
• Explains why a scientific investigation will work the same way in different places*	sets of data are collected, or data is averagedCompares the results produced when an experiment is	• Recognizes that uncertainty in measurement can produce results that differ slightly from experiment to
• Recognizes that scientific ideas are tentative and	repeated several times*	experiment*
therefore subject to change*	• Recognizes that it can be difficult to determine the sources of error in an experiment*	• Recognizes that slight changes in an experimental method can produce changes in the result of an
• Explains that as scientific knowledge increases, scientific ideas are subject to change	 Lists possible reasons for inconsistent results* 	investigation*
		Recognizes that slight differences in the things being

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through the use of skepticism*			
• Distinguishes hypotheses from conclusions and			• Distinguishes hypotheses from conclusions and
observations			0 /1
• Explains why there may be discrepancies between a			• Explains why there may be discrepancies between a
scientific law and actual observations*			scientific law and actual observations*
• Relates scientific theory, generation of hypotheses, a			• Relates scientific theory, generation of hypotheses, and
experimentation*			
• Distinguishes between the ideas of hypothesis, fact,			
observation, opinion, model, and theory			observation, opinion, model, and theory
Classifies a particular statement as an hypothesis*			
			• Compares the terms hypothesis, theory, principle, law,
model, paradigm as used by scientists*			

		 Contrasts the terms theory and law* Explains how certain factors may bias data* Explains why explanations about the natural world that are based on personal beliefs cannot be considered science* Explains why explanations about the natural world that are based on religious values cannot be considered science* Explains why explanations about the natural world that are based on superstition cannot be considered science* Explains why explanations about the natural world that are based on superstition cannot be considered science* Explains why explanations about the natural world that are based on authority cannot be considered science* Recognizes that scientific explanations are considered valid when they meet multiple criteria (e.g., consistency with the evidence seen in nature, respect for the rules of evidence, openness to criticism, communication of methods used, public communication of results)*
 Science and Technology; Personal-Social Issues Explains how scientific knowledge and economics drive the development of technology* Explains that scientific advances often depend on development of new technologies* 	 Science and Technology; Personal-Social Issues Applies the steps of technological design Compares and contrasts the procedures used in scientific inquiry and technological design* 	Science and Technology; Personal-Social Issues
New Vocabulary: accelerate, apparent size, arrangement, balance (equilibrium), claim, contact, discard, disequilibrium, double-pan balance, evaluate, evolution, evolutionary change, evolutionary trend, evolve, field of view, geologist, magnification power, material, observable, orderly, percentage, physical model, predictable, regular increase, reject, reversible, scale model, scaled up	<i>New Vocabulary:</i> absolute knowledge, balance, coincidence, cyclic, cyclic phenomenon, episodic, inconclusive, indicate, number pattern, phenomena, regulated, repeat, replication, results, testable, vary	<i>New Vocabulary:</i> cancellation, finding (scientific), invalid (data), opposing forces, principle, regular time interval
<i>New Signs and Symbols:</i> . , . decimal point, ft feet, km kilometer/kilometre, %	New Signs and Symbols: cubic centimeter/centimetre	New Signs and Symbols: none

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 221 - 230

Skills and Concepts to Enhance 211 - 220	Skills and Concepts to Develop 221 - 230	Skills and Concepts to Introduce 231 - 240
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
 Classifies an example of parts that work together as a system* Understands that adding or removing components of systems will cause changes to those systems* Understands that interacting components of systems affect each other* 	• Gives examples of inputs and outputs of systems*	• Understands that ordering sets of objects requires characteristics that have multiple forms (e.g., height, but not right/left-handedness)*
Evidence, Models and Explanations	Evidence, Models and Explanations	Evidence, Models and Explanations
 Explains how models help scientists to understand the physical world* Compares physical, mathematical, and conceptual models* Gives examples of conceptual (e.g., scientific) models Evaluates the usefulness of a model* Describes circumstances that might lead to the revision of a scientific model Orders the stages that are involved in creating a scientific model* 	 Differentiates among examples of models and observations* Selects appropriate scale models to represent data* Assesses how well a model represents a real life event, process, or concept* 	• Analyzes relationships using a simple mathematical model*
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
 Gives examples of equilibrium in systems Predicts how a particular change will affect the equilibrium of a system* Gives examples of systems which show balance* Analyzes changes occurring within systems* Gives examples of things in nature which do not change* Determines the rate or gradient of change in systems, when given length of time and a total measurement of change* Predicts patterns of change to systems* Extrapolates using rate of change to a system* Distinguishes cycles from non-cyclic events Understands that rates describe the time it takes for a unit of a given event to occur* 	 Explains that equilibrium can be produced when changes occur in opposition to each other and at the same time* Gives examples of maintenance of equilibrium (homeostasis) in the human body* Describes characteristics of a gradient* Gives examples of cyclic events* Determines evolutionary trends in Earth/space, physical, and biological systems* 	 Explains that equilibrium can be produced when changes occur in opposition to each other and at the same time* Infers that a system is in balance due to forces equally opposing each other* Recognizes examples of dynamic equilibrium in systems* Infers that things that have come to rest are in equilibrium* Classifies disparate events as examples of equilibrium* Determines gradients of change to systems when given a table of relevant data* Gives examples of gradient change* Uses symbolic equations to represent change*

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Analyzes changes in scale		
• Understands that correlations seen in data are most		
useful in making predictions when a cause-effect		
*		
 userul in making predictions when a cause-effect relationship is established* Nature of Science Understands that a key part of science is for scientists to confirm each other's findings* Understands that to replicate an experiment, the conditions of the experiment should be as similar to the original as possible Understands that patterns and trends are easier to see when an experiment is repeated several times, multiple sets of data are collected, or data is averaged Compares the results produced when an experiment is repeated several times* Recognizes that it can be difficult to determine the sources of error in an experiment* Lists possible reasons for inconsistent results* Recognizes that a controlled experiment will produce reproducible results* Compares controlled and uncontrolled experiments in terms of the consistency of data produced* Recognizes that science changes as new theories and evidence arise* Explains that scientific knowledge is tentative and therefore subject to change as new evidence is uncovered* Gives examples of changes in scientific knowledge that have resulted from the appearance of new evidence* Recognizes that when data is incomplete, great opportunity for advancement exists* 	 Nature of Science Recognizes why it is important for scientific observations to be repeated before drawing conclusions* Recognizes why other scientists must be able to replicate results of an experiment* Recognizes that an idea must be tested multiple times before being accepted or rejected* Recognizes that uncertainty in measurement can produce results that differ slightly from experiment to experiment* Recognizes that slight changes in an experimental method can produce changes in the result of an investigation* Recognizes that slight differences in the things being investigated can produce differences in the result* Recognizes that when results differ, it is necessary to judge whether the differences are trivial or significant, and further study may be needed to determine this* Explains variations in the data recording during an experiment* Explains limitations in the data recording during an experiment* Explains why a controlled experiment will produce reproducible results* Explains why repeating an investigation multiple times may increase the reliability of the data collected* 	 Nature of Science Recognizes why it is important for scientific observations to be repeated before drawing conclusions* Classifies a given experiment as an example of replication when given the conditions and purpose of the experiment* Recognizes that when results differ, it is necessary to judge whether the differences are trivial or significant, and further study may be needed to determine this* Recognizes that when an observation does not agree with accepted scientific theory, it may be because the observation is mistaken or fraudulent, or it may be because the theory is wrong* Recognizes that all scientific knowledge, regardless of age, can be reviewed, criticized, and if necessary, discarded* Explains that because theories are models, they may be revised as more data becomes available* Recognizes that as scientific theories are continually reevaluated, minor shifts in scientific thinking may occur*
 opportunity for advancement exists* Recognizes that when little understanding of an area exists, scientists may interpret data and theory differently* 	• Explains that before experimental results are generalized to a wider set of conditions, it is important to repeat the experiment using these conditions (e.g.,	 reevaluated, major shifts in scientific thinking may occur* Recognizes that scientific ideas that are supported by
 Explains that scientists investigate for many differing reasons, but the ultimate purpose is to understand the natural world* Describer characteristics of scientific thinking* 	 drug tests, use of model organisms)* Explains why scientific ideas may change over time* Recognizes that despite the tentative nature of science, most core ideas of science have been confirmed 	 large amounts of data and observation are unlikely to change in the future* Recognizes that when there is insufficient data to answer the question, multiple scientific explanations
 Describes characteristics of scientific thinking* Recognizes that reasoning can be distorted by strong emotions* Defines scientific theory* Contrasts the terms hypothesis, theory, principle, law, model, and paradigm as used by scientists* Classifies a particular scientific explanation as a theory* 	 most core ideas of science have been confirmed through much observation and experimentation* Recognizes that when an observation does not agree with accepted scientific theory, it may be because the observation is mistaken or fraudulent, or it may be because the theory is wrong* Recognizes that any conclusion can be challenged by 	 Explains that when data is incomplete, new data can resolve competing theories* Recognizes that in areas of limited understanding, it may not be possible to determine which explanation is correct*

 Distinguishes examples of observations from facts, theories, and hypotheses* Classifies a particular statement as an hypothesis* Describes factors that produce biased data* Explains that science limits itself to natural phenomena* Explains that scientific explanations limit themselves to natural causes for natural phenomena* Recognizes that a key assumption of science is that the universe is a vast, single system that operates according to a single, consistent set of rules* Recognizes that a key assumption of science is that the rules which govern the universe can be discovered and understood by careful, systematic study* Recognizes that scientific explanations are considered 	 new evidence* Recognizes that all scientific knowledge, regardless of age, can be reviewed, criticized, and if necessary, discarded* Explains that because theories are models, they may be revised as more data becomes available* Explains that as new theories develop, previous data is not discarded but is reevaluated* Explains how experimental results may cause modification of a theory or hypothesis* Recognizes that scientific knowledge accumulates most rapidly after the acceptance of a major new theory* Recognizes that as scientific theories are continually reevaluated, minor shifts in scientific thinking may occur* 	 Explains why areas of science with incomplete data are areas of opportunity* Recognizes that the purpose of scientific inquiry is not the discovery of absolute truth* Explains how the use of logical arguments distinguishes science from other disciplines* Explains how the use of skepticism distinguishes science from other disciplines* Evaluates pseudoscientific claims in the media* Defines scientific paradigm* Explains how theories are used to answer questions* Explains how facts are used to answer questions* Explains how facts are used to answer questions* Explains why explanations about the natural world that are based on personal beliefs cannot be considered
 Recognizes that scientific explanations are considered valid when they meet multiple criteria (e.g., consistency with the evidence seen in nature, respect for the rules of evidence, openness to criticism, communication of methods used, public communication of results)* Explains that scientific theories depend on logically consistent arguments* 	6 1	 Explains why explanations about the natural world that are based on personal beliefs cannot be considered science* Explains why explanations about the natural world that are based on religious values cannot be considered science* Explains why explanations about the natural world that are based on superstition cannot be considered science* Explains why explanations about the natural world that are based on authority cannot be considered science*
	 Recognizes that the purpose of scientific inquiry is not the discovery of absolute truth* Recognizes practices of science that distinguish it from other ways of knowing* 	

	• Explains how the use of logical arguments distinguishes	
	science from other disciplines*Recognizes that reasoning can be distorted by faulty	
	• Recognizes that reasoning can be distorted by faulty data*	
	Recognizes that scientific understanding is produced	
	through the use of logical arguments*	
	• Recognizes that scientific understanding is produced	
	through the use of skepticism*	
	Distinguishes hypotheses from conclusions and	
	observationsExplains why there may be discrepancies between a	
	scientific law and actual observations*	
	Relates scientific theory, generation of hypotheses, and	
	experimentation*	
	• Distinguishes between the ideas of hypothesis, fact,	
	observation, opinion, model, and theory	
	• Classifies a particular statement as an hypothesis*	
	• Compares the terms hypothesis, theory, principle, law, model, paradigm as used by scientists*	
	• Contrasts the terms theory and law*	
	 Explains how certain factors may bias data* 	
	• Explains why explanations about the natural world that	
	are based on personal beliefs cannot be considered science*	
	• Explains why explanations about the natural world that	
	are based on religious values cannot be considered	
	science*	
	• Explains why explanations about the natural world that	
	are based on superstition cannot be considered	
	science*Explains why explanations about the natural world that	
	• Explains why explanations about the natural world that are based on authority cannot be considered science*	
	 Recognizes that scientific explanations are considered 	
	valid when they meet multiple criteria (e.g.,	
	consistency with the evidence seen in nature, respect	
	for the rules of evidence, openness to criticism, communication of methods used, public	
	communication of methods used, public communication of results)*	
Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
Applies the steps of technological design		
Compares and contrasts the procedures used in		
scientific inquiry and technological design*		
New Vocabulary: absolute knowledge, balance,	<i>New Vocabulary:</i> cancellation, finding (scientific), invalid (data), opposing forces, principle, regular time interval	New Vocabulary: factual, procedure, replicable, researcher
coincidence, cyclic, cyclic phenomenon, episodic,		

inconclusive, indicate, number pattern, phenomena, regulated, repeat, replication, results, testable, vary		
New Signs and Symbols: cubic centimeter/centimetre	New Signs and Symbols: none	New Signs and Symbols: none

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: 231 - 240

Skills and Concepts to Enhance 221 - 230	Skills and Concepts to Develop 231 - 240	Skills and Concepts to Introduce Above 240
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
• Gives examples of inputs and outputs of systems*	• Understands that ordering sets of objects requires characteristics that have multiple forms (e.g., height, but not right/left-handedness)*	
Evidence, Models and Explanations	Evidence, Models and Explanations	Evidence, Models and Explanations
 Differentiates among examples of models and observations* Selects appropriate scale models to represent data* Assesses how well a model represents a real life event, process, or concept* 	• Analyzes relationships using a simple mathematical model*	
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
 Explains that equilibrium can be produced when changes occur in opposition to each other and at the same time* Gives examples of maintenance of equilibrium (homeostasis) in the human body* Describes characteristics of a gradient* Gives examples of cyclic events* Determines evolutionary trends in Earth/space, physical, and biological systems* 	 Explains that equilibrium can be produced when changes occur in opposition to each other and at the same time* Infers that a system is in balance due to forces equally opposing each other* Recognizes examples of dynamic equilibrium in systems* Infers that things that have come to rest are in equilibrium* Classifies disparate events as examples of equilibrium* Determines gradients of change to systems when given a table of relevant data* Gives examples of gradient change* Uses symbolic equations to represent change* 	 Gives examples of dynamic equilibrium in systems* Infers that things that have come to rest are in equilibrium*
Nature of Science	Nature of Science	Nature of Science
 Recognizes why it is important for scientific observations to be repeated before drawing conclusions* Recognizes why other scientists must be able to replicate results of an experiment* Recognizes that an idea must be tested multiple times before being accepted or rejected* Recognizes that uncertainty in measurement can produce results that differ slightly from experiment to 	 Recognizes why it is important for scientific observations to be repeated before drawing conclusions* Classifies a given experiment as an example of replication when given the conditions and purpose of the experiment* Recognizes that when results differ, it is necessary to judge whether the differences are trivial or significant, and further study may be needed to determine this* 	

experiment*	Recognizes that when an observation does not agree	
Recognizes that slight changes in an experimental	with accepted scientific theory, it may be because the	
method can produce changes in the result of an	observation is mistaken or fraudulent, or it may be	
investigation*	because the theory is wrong*	
• Recognizes that slight differences in the things being	• Recognizes that any conclusion can be challenged by	
investigated can produce differences in the result*	new evidence*	
• Recognizes that when results differ, it is necessary to	• Recognizes that all scientific knowledge, regardless of	
judge whether the differences are trivial or significant,	age, can be reviewed, criticized, and if necessary,	
and further study may be needed to determine this*	discarded*	
• Explains variations in the data recorded during an	• Explains that because theories are models, they may be	
investigation*	revised as more data becomes available*	
• Explains limitations in the data recording during an	Recognizes that scientific knowledge accumulates most	
experiment*	rapidly after the acceptance of a major new theory*	
Explains why a controlled experiment will produce	 Recognizes that as scientific theories are continually 	
reproducible results*	reevaluated, minor shifts in scientific thinking may	
 Explains why repeating an investigation multiple times 	occur*	
• Explains why repeating an investigation multiple times may increase the reliability of the data collected*	 Recognizes that as scientific theories are continually 	
	• Recognizes that as scientific theories are continually reevaluated, major shifts in scientific thinking may	
• Explains that before experimental results are	occur*	
generalized to a wider set of conditions, it is important		
to repeat the experiment using these conditions (e.g.,	• Recognizes that scientific ideas that are supported by	
drug tests, use of model organisms)*	large amounts of data and observation are unlikely to	
• Explains why scientific ideas may change over time*	change in the future*	
• Recognizes that despite the tentative nature of science,	• Recognizes that when there is insufficient data to	
most core ideas of science have been confirmed	answer the question, multiple scientific explanations	
through much observation and experimentation*	may exist simultaneously*	
Recognizes that when an observation does not agree	• Explains that when data is incomplete, new data can	
with accepted scientific theory, it may be because the	resolve competing theories*	
observation is mistaken or fraudulent, or it may be	• Recognizes that in areas of limited understanding, it	
because the theory is wrong*	may not be possible to determine which explanation is	
• Recognizes that any conclusion can be challenged by	correct*	
new evidence*	• Explains why areas of science with incomplete data are	
• Recognizes that all scientific knowledge, regardless of	areas of opportunity*	
age, can be reviewed, criticized, and if necessary,	• Recognizes that the purpose of scientific inquiry is not	
discarded*	the discovery of absolute truth*	
• Explains that because theories are models, they may be	• Explains how the use of logical arguments distinguishes	
revised as more data becomes available*	science from other disciplines*	
• Explains that as new theories develop, previous data is	• Explains how the use of skepticism distinguishes	
not discarded but is reevaluated*	science from other disciplines*	
• Explains how experimental results may cause	• Evaluates pseudoscientific claims in the media*	
modification of a theory or hypothesis*	 Defines scientific paradigm* 	
Recognizes that scientific knowledge accumulates most	 Explains how theories are used to answer questions* 	
rapidly after the acceptance of a major new theory*	 Explains how laws are used to answer questions* 	
 Recognizes that as scientific theories are continually 	 Explains how facts are used to answer questions* 	
reevaluated, minor shifts in scientific thinking may		
	• Explains why explanations about the natural world that	

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occur*	are based on personal beliefs cannot be considered	
• Recognizes that as scientific theories are continually	science*	
reevaluated, major shifts in scientific thinking may	• Explains why explanations about the natural world that	
occur*	are based on religious values cannot be considered	
• Recognizes that scientific ideas that are supported by	science*	
large amounts of data and observation are unlikely to	• Explains why explanations about the natural world that	
change in the future*	are based on superstition cannot be considered	
• Gives examples of changes in scientific knowledge that	science*	
have resulted from the appearance of new evidence*	• Explains why explanations about the natural world that	
• Recognizes that when there is insufficient data to	are based on authority cannot be considered science*	
answer the question, multiple scientific explanations		
may exist simultaneously*		
• Explains that when data is incomplete, new data can		
resolve competing theories*		
• Recognizes that when data is incomplete, great		
opportunity for advancement exists*		
• Recognizes that when little understanding of an area		
exists, scientists may interpret data and theory		
differently*		
• Recognizes that in areas of limited understanding, it		
may not be possible to determine which explanation is		
correct*		
• Recognizes that conclusions that are supported by		
insufficient data are weak*		
• Explains why areas of science with incomplete data are		
areas of opportunity*		
• Recognizes that the purpose of scientific inquiry is not		
the discovery of absolute truth*		
• Recognizes practices of science that distinguish it from		
other ways of knowing*		
• Explains how the use of logical arguments distinguishes		
science from other disciplines*		
• Recognizes that reasoning can be distorted by faulty data*		
• Recognizes that scientific understanding is produced		
through the use of logical arguments*		
• Recognizes that scientific understanding is produced		
through the use of skepticism*		
Distinguishes hypotheses from conclusions and observations		
• Explains why there may be discrepancies between a scientific law and actual observations*		
• Relates scientific theory, generation of hypotheses, and		
experimentation*		

 Distinguishes between the ideas of hypothesis, fact, observation, opinion, model, and theory Classifies a particular statement as an hypothesis* Compares the terms hypothesis, theory, principle, law, model, paradigm as used by scientists* Contrasts the terms theory and law* Explains how certain factors may bias data* Explains why explanations about the natural world that are based on personal beliefs cannot be considered science* Explains why explanations about the natural world that are based on religious values cannot be considered science* Explains why explanations about the natural world that are based on superstition cannot be considered science* Explains why explanations about the natural world that are based on superstition cannot be considered science* Explains why explanations about the natural world that are based on authority cannot be considered science* Explains why explanations about the natural world that are based on authority cannot be considered science* Explains why explanations about the natural world that are based on authority cannot be considered science for the rules of evidence seen in nature, respect for the rules of evidence, openness to criticism, communication of methods used, public communication of results)* 		
Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
New Vocabulary: cancellation, finding (scientific), invalid	New Vocabulary: factual, procedure, replicable, researcher	New Vocabulary: none
(data), opposing forces, principle, regular time interval		, ,
New Signs and Symbols: none	New Signs and Symbols: none	New Signs and Symbols: none

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Subject: Concepts and Processes Goal Strand: Connections; Nature of Science RIT Score Range: Above 240

Skills and Concepts to Enhance 231 - 240	Skills and Concepts to Develop Above 240
System, Order, Organization, Interactions; Form	System, Order, Organization, Interactions; Form
• Understands that ordering sets of objects requires characteristics that have multiple forms (e.g., height, but not right/left-handedness)*	
Evidence, Models and Explanations	Evidence, Models and Explanations
Analyzes relationships using a simple mathematical model*	
Evolution, Equilibrium and Energy	Evolution, Equilibrium and Energy
 Explains that equilibrium can be produced when changes occur in opposition to each other and at the same time* Infers that a system is in balance due to forces equally opposing each other* Recognizes examples of dynamic equilibrium in systems* Infers that things that have come to rest are in equilibrium* Classifies disparate events as examples of equilibrium* Determines gradients of change to systems when given a table of relevant data* Gives examples of gradient change* Uses symbolic equations to represent change* 	 Gives examples of dynamic equilibrium in systems* Infers that things that have come to rest are in equilibrium*
Nature of Science	Nature of Science
 Recognizes why it is important for scientific observations to be repeated before drawing conclusions* Classifies a given experiment as an example of replication when given the conditions and purpose of the experiment* Recognizes that when results differ, it is necessary to judge whether the differences are trivial or significant, and further study may be needed to determine this* Recognizes that when an observation does not agree with accepted scientific theory, it may be because the observation is mistaken or fraudulent, or it may be 	

because the theory is wrong* • Recognizes that any conclusion can be challenged by new evidence* • Recognizes that all scientific knowledge, regardless of age, can be reviewed, criticized, and if necessary, discarded* • Explains that because theories are models, they may be revised as more data becomes available* • Recognizes that scientific knowledge accumulates most rapidly after the acceptance of a major new theory* • Recognizes that as scientific theories are continually reevaluated, minor shifts in scientific thinking may occur* • Recognizes that as scientific theories are continually reevaluated, major shifts in scientific thinking may occur* • Recognizes that scientific ideas that are supported by large amounts of data and observation are unlikely to change in the future* • Recognizes that when there is insufficient data to answer the question, multiple scientific explanations may exist simultaneously* • Explains that when data is incomplete, new data can resolve competing theories* • Recognizes that in areas of limited understanding, it may not be possible to determine which explanation is correct* • Explains why areas of science with incomplete data are areas of opportunity* • Recognizes that the purpose of scientific inquiry is not the discovery of absolute truth* • Explains how the use of logical arguments distinguishes science from other disciplines* • Explains how the use of skepticism distinguishes science from other disciplines* • Evaluates pseudoscientific claims in the media* • Defines scientific paradigm* • Explains how theories are used to answer questions* • Explains how laws are used to answer questions* • Explains how facts are used to answer questions* • Explains why explanations about the natural world that are based on personal beliefs cannot be considered science* • Explains why explanations about the natural world that

 are based on religious values cannot be considered science* Explains why explanations about the natural world that are based on superstition cannot be considered science* Explains why explanations about the natural world that are based on authority cannot be considered science* 	
Science and Technology; Personal-Social Issues	Science and Technology; Personal-Social Issues
New Vocabulary: factual, procedure, replicable, researcher	New Vocabulary: none
New Signs and Symbols: none	New Signs and Symbols: none

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