

**Bangor School Department  
Science Parameters for Grades 6 – 8 and Applied Science**

A. *Unifying Themes: Students apply the principles of **systems**, **models**, constancy and change, and scale in science and technology.*

Rev. Dec 2, 2010

***A1 Systems***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe and apply principles of <b>systems</b> in man-made things, natural things, and processes.</b>			
a.	Explain how individual parts working together in a <b>system</b> (including organisms, Earth systems, solar systems, or manmade structures) can do more than each part individually.	Human Systems & Your Health		Astronomy Structure of Matter
b.	Explain how the output of one part of a <b>system</b> , including waste products from manufacturing or organisms, can become the input of another part of a <b>system</b> .	Human Systems & Your Health	Photosynthesis and Respiration Ecosystems & Biomes	
c.	Describe how <b>systems</b> are nested and that <b>systems</b> may be thought of as containing subsystems (as well as being a subsystem of a larger <b>system</b> ) and apply the understanding to analyze <b>systems</b> .	Human Systems & Your Health	Photosynthesis and Respiration	Astronomy

***A2 Models***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students use <b>models</b> to examine a variety of real-world phenomena from the physical setting, the living environment, and the technological world and compare advantages and disadvantages of various <b>models</b>.</b>			

a.	Compare different types of <b>models</b> that can be used to represent the same thing (including <b>models</b> of chemical reactions, motion, or cells) in order to match the purpose and complexity of a model to its use.			Structure of Matter Astronomy Forces and Motion
b.	Propose changes to <b>models</b> and explain how those changes may better reflect the real thing.	Earth Systems		Structure of Matter Astronomy Forces and Motion

### ***A3 Constancy and Change***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe how patterns of change vary in physical, biological, and technological systems.</b>			
a.	Describe <b>systems</b> that are changing including ecosystems, Earth <b>systems</b> , and technologies.	Earth Systems	Ecosystems & Biomes	Astronomy
b.	Give examples of <b>systems</b> including ecosystems, Earth systems, and technologies that appear to be unchanging (even though things may be changing within the <b>system</b> ) and identify any feedback mechanisms that may be modifying the changes.	Human Systems & Your Health Earth Systems	Ecosystems & Biomes	Astronomy
c.	Describe rates of change and cyclic patterns using appropriate grade-level mathematics.	Becoming a Scientist		Forces and Motion Astronomy

#### A4 Scale

		Grade 6	Grade 7	Grade 8
	<b>Students use scale to describe objects, phenomena, or processes related to Earth, space, matter, and mechanical and living systems.</b>			
a.	Describe how some things change or work differently at different scales.			Astronomy Structure of Matter
b.	Use proportions, averages, and ranges to describe small and large extremes of scale.	Earth Systems		Astronomy

*B. The Skills and Traits of Scientific Inquiry and **Technological Design**: .Students plan, conduct, analyze data from and communicate results of in-depth scientific investigations; and they use a systematic process, tools, equipment, and variety of materials to create **technological design** and produce a solution or product to meet a specified need.*

#### B1 Skills and Traits of Scientific Inquiry

		Grade 6	Grade 7	Grade 8
	<b>Students plan, conduct, analyze data from, and communicate results of investigations, including simple experiments.</b>			
a.	Identify questions that can be answered through scientific investigations.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
b.	Design and safely conduct scientific investigations including experiments with controlled variables.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
c.	Use appropriate tools, metric units, and techniques to gather, analyze, and interpret data.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy

d.	Use mathematics to gather, organize, and present data and structure convincing explanations.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
e.	Use logic, critical reasoning and evidence to develop descriptions, explanations, predictions, and <a href="#">models</a> .	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
f.	Communicate, critique, and analyze their own scientific work and the work of other students.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy

***B2 Skills and Traits of Technological Design***

		Grade 6	Grade 7	Grade 8
	<b>Students use a systematic process, tools, equipment, and a variety of materials to design and produce a solution or product to meet a specified need, using established criteria.</b>			
a.	Identify appropriate problems for <a href="#">technological design</a> .	Earth Systems Becoming a Scientist		Structure of Matter
b.	Design a solution or product.	Earth Systems Becoming a Scientist		Structure of Matter
c.	Communicate a proposed design using drawings and simple <a href="#">models</a> .	Earth Systems Becoming a Scientist		Structure of Matter
d.	Implement a proposed design.	Earth Systems Becoming a Scientist		Structure of Matter
e.	Evaluate a completed design or product.	Earth Systems Becoming a Scientist		Structure of Matter
f.	Suggest improvements for their own and others' designs and try out proposed modifications.	Earth Systems Becoming a Scientist		Structure of Matter

g.	Explain the design process including the stages of problem identification, solution design, implementation, and evaluation.	Earth Systems Becoming a Scientist		Structure of Matter
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*C. The Scientific and **Technological Enterprise**: Students understand the history and nature of scientific knowledge and technology, the processes of inquiry and technological design, and the impacts science and technology have on society and the environment.*

***C1 Understandings of Inquiry***

		Grade 6	Grade 7	Grade 8
	<b>Students describe how scientists use varied and systematic approaches to investigations that may lead to further investigations.</b>			
a.	Explain how the type of question informs the type of investigation.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
b.	Explain why it is important to identify and control variables and replicate trials in experiments.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
c.	Describe how scientists' analyses of findings can lead to new investigations.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy

***C2 Understandings About Science and Technology***

		Grade 6	Grade 7	Grade 8
	<b>Students understand and compare the similarities and differences between scientific inquiry and <b>technological design</b>.</b>			
a.	Compare the process of scientific inquiry to the process of technological design.	Earth Systems		Structure of Matter

b.	Explain how constraints and consequences impact scientific inquiry and <a href="#">technological design</a> .	Earth Systems		Structure of Matter
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***C3 Science, Technology and Society***

		Grade 6	Grade 7	Grade 8
	<b>Students identify and describe the role of science and technology in addressing personal and societal challenges.</b>			
a.	Describe how science and technology can help address societal challenges including population, natural hazards, sustainability, personal health and safety, and environmental quality.	Earth Systems Human Systems & Your Health	Causes & Effects of Diseases Ecosystems & Biomes	
b.	Identify personal choices that can either positively or negatively impact society including population, ecosystem sustainability, personal health, and environmental quality.	Earth Systems Human Systems & Your Health	Causes & Effects of Diseases Ecosystems & Biomes	
c.	Identify factors that influence the development and use of science and technology.	Becoming a Scientist	Causes & Effects of Diseases	Forces & Motions Structure of Matter Astronomy

***C4 History and Nature of Science***

		Grade 6	Grade 7	Grade 8
	<b>Students describe historical examples that illustrate how science advances knowledge through the scientists involved and through the ways scientists think about their work and the work of others.</b>			

a.	Describe how women and men of various backgrounds, working in teams or alone and communicating about their ideas extensively with others, engage in science, engineering, and related fields.	Becoming a Scientist		Forces & Motion Structure of Matter Astronomy
b.	Describe a breakthrough from the history of science that contributes to our current understanding of science.	Human Systems & Your Health Earth Systems		Forces & Motion Structure of Matter Astronomy
c.	Describe and provide examples that illustrate that science is a human endeavor that generates explanations based on verifiable evidence that are subject to change when new evidence does not match existing explanations.	Earth Systems		Forces & Motion Structure of Matter Astronomy

*D. The Physical Setting: Students understand the universal nature of matter, energy, force, and motion and identify how these relationships are exhibited in Earth systems, in the solar system, and throughout the universe.*

***DI Universe and Solar System***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students explain the movements and describe the location, composition, and characteristics of our solar system and universe, including planets, the sun, and galaxies.</b>			
a.	Describe the different kinds of objects in the solar system including planets, sun, moons, asteroids, and comets.			Astronomy
b.	Explain the motions that cause days, years, phases of the moon, and eclipses.			Astronomy

c.	Describe the location of our solar system in its galaxy and explain that other galaxies exist and that they include stars and planets.			Astronomy
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***D2 Earth***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe the various cycles, physical and biological forces and processes, position in space, energy transformations, and human actions that affect the short-term and long-term changes to the Earth.</b>			
a.	Explain how the tilt of Earth’s rotational axis relative to the plane of its yearly orbit around the sun affects the day length and sunlight intensity to cause seasons.			Astronomy
b.	Describe Earth Systems – biosphere, atmosphere, hydrosphere and lithosphere – and cycles and interactions within them (including water moving among and between them, rocks forming and transforming, and weather formation).	Earth Systems		
c.	Give several reasons why the climate is different in different regions of the Earth.	Earth Systems/ Social Studies		
d.	Describe significant Earth resources and how their limited supply affects how they are used.	Earth Systems	Ecosystems & Biomes	
e.	Describe the effect of gravity on objects on Earth.	Earth Systems		Astronomy

f.	Give examples of abrupt changes and slow changes in Earth Systems.	Earth Systems		
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***D3 Matter and Energy***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe physical and chemical properties of matter, interactions and changes in matter, and transfer of energy through matter.</b>			
a.	Describe that all matter is made up of atoms and distinguish between/among elements, atoms, and molecules.			Structure of Matter
b.	Describe how physical characteristics of elements and types of reactions they undergo have been used to create the Periodic Table.			Structure of Matter
c.	Describe the difference between physical and chemical change.	Earth Systems		Structure of Matter
d.	Explain the relationship of the motion of atoms and molecules to the states of matter for gases, liquids, and solids.			Structure of Matter
e.	Explain how atoms are packed together in arrangements that compose all substances including elements, compounds, mixtures, and solutions.			Structure of Matter
f.	Explain and apply the understanding that substances have characteristic properties, including density, boiling point, and solubility and these properties are not dependent on the amount of matter present.			Structure of Matter
g.	Use the idea of atoms to explain the conservation of matter.			Structure of Matter
h.	Describe several different types of energy forms including heat energy, chemical energy, and mechanical energy.	Earth Systems		

i.	Use examples of <b>energy transformations</b> from one form to another to explain that energy cannot be created or destroyed.	Earth Systems		
j.	Describe how <b>heat</b> is transferred from one object to another by conduction, convection, and/or radiation.	Earth Systems		
k.	Describe the properties of solar radiation and its interaction with objects on Earth.	Earth Systems		

***D4 Force and Motion***

Astronomy		Grade 6	Grade 7	Grade 8
	<b>Students describe the force of gravity, the motion of objects, the properties of waves, and the wavelike property of energy in light waves.</b>			
a.	Describe the similarities and differences in the motion of sound vibrations, earthquakes, and light waves.	Earth Systems		
b.	Explain the relationship among visible light, the electromagnetic spectrum, and sight.			Forces & Motion
c.	Describe and apply an understanding of how the gravitational force between any two objects would change if their mass or the distance between them changed.			Astronomy
d.	Describe and apply an understanding of how electric currents and magnets can exert force on each other.			Forces & Motion

e.	Describe and apply an understanding of the effects of multiple forces on an object, and how unbalanced forces will cause changes in the speed or direction.			Forces and Motion Astronomy
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*E. The Living Environment: Students understand that cells are the basic unit of life, that all life as we know it has evolved through genetic transfer and natural selection to create a great diversity of organisms, and that these organisms create interdependent webs through which matter and energy flow. Students understand similarities and differences between humans and other organisms and the interconnections of these interdependent webs.*

### ***E1 Biodiversity***

		Grade 6	Grade 7	Grade 8
	<b>Students differentiate among organisms based on biological characteristics and identify patterns of similarity.</b>			
a.	Compare physical characteristics that differentiate organisms into groups (including plants that use sunlight to make their own food, animals that consume energy-rich food, and organisms that cannot easily be classified as either).		Classification, Heredity, & Cell Division Ch. 2, Prentice Hall, <u>Life Science</u>	
b.	Explain how biologists use internal and external anatomical features to determine relatedness among organisms and to form the basis for classification systems.		Classification, Heredity, & Cell Division Ch. 2, Prentice Hall, <u>Life Science</u>	
c.	Explain ways to determine whether organisms are the same species.		Classification, Heredity, & Cell Division Ch. 2, Prentice Hall, <u>Life Science</u>	
d.	Describe how external and internal structures of animals and plants contribute to the variety of ways organisms are able to find food and reproduce.		Classification, Heredity, & Cell Division Ch. 4 & 6, Prentice Hall, <u>Life Science</u> Ecosystems & Biomes	

***E2 Ecosystems***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students examine how the characteristics of the physical, non-living (abiotic) environment, the types and behaviors of living (biotic) organisms, and the flow of matter and energy affect organisms and the ecosystem of which they are part.</b>			
a.	List various kinds of resources within different biomes for which organisms compete.		Ecosystems & Biomes	
b.	Describe ways in which two types of organisms may interact (including competition, predator/prey, producer/consumer/decomposer, parasitism, and mutualism) and describe the positive and negative consequences of such interactions.		Ecosystems & Biomes	
c.	Describe the source and flow of energy in the two major food webs, terrestrial and marine.		Ecosystems & Biomes	
d.	Describe how matter and energy change from one form to another in living things and in the physical environment.		Ecosystems & Biomes	
e.	Explain that the total amount of matter in the environment stays the same even as its form and location change.	Earth Systems		

**E3 Cells**

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe the hierarchy of organization and function in organisms, and the similarities and differences in structure, function, and needs among and within organisms.</b>			
a.	Describe the basic functions of organisms carried out within cells including the extracting of energy from food and the elimination of wastes.		Photosynthesis and Respiration	
b.	Explain the relationship among cells, tissues, organs, and organ <b>systems</b> , including how tissues and organs serve the needs of cells and organisms.	Human Systems & Your Health		
c.	Compare the structures, <b>systems</b> , and interactions that allow single-celled organisms and multi-celled plants and animals, including humans to defend themselves, acquire and use energy, self-regulate, reproduce, and coordinate movement.		Photosynthesis and Respiration	
d.	Explain that all living things are composed of cells numbering from just one to millions.		Photosynthesis and Respiration	

***E4 Heredity and Reproduction***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe the general characteristics and mechanisms of reproduction and heredity in organisms, including humans, and ways in which organisms are affected by their genetic traits.</b>			
a.	Explain that sexual reproduction includes fertilization that results in the inclusion of genetic information from each parent and determines the inherited traits that are a part of every cell.		Classification, Heredity, & Cell Division Ch. 3 & 4, Prentice Hall, <u>Life Science</u>	
b.	Identify some of the risks to the healthy development of an embryo including mother's diet, lifestyle, and hygiene.		Chemical Health Unit	
c.	Describe asexual reproduction as a process by which all genetic information comes from one parent and determines the inherited traits that are a part of every cell.		Classification, Heredity, & Cell Division Ch. 3 & 4, Prentice Hall, <u>Life Science</u>	

***E5 Evolution***

		<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	<b>Students describe the evidence that evolution occurs over many generations, allowing species to acquire many of their unique characteristics or adaptations.</b>			
a.	Explain how the layers of sedimentary rock and their contained fossils provide evidence for the long history of Earth and for the long history of changing life.	Earth Systems		

b.	Describe how small differences between parents and offspring can lead to descendants who are very different from their ancestors.		Classification, Heredity, & Cell Division Ch. 3 & 4, Prentice Hall, <u>Life Science</u>	
c.	Describe how variations in the behavior and traits of an offspring may permit some of them to survive a changing environment.		Ecosystems & Biomes	
d.	Explain that new varieties of cultivated plants and domestic animals can be developed through genetic modification and describe the impacts of the new varieties of plants and animals.		Classification, Heredity, & Cell Division Ch. 3 & 4, Prentice Hall, <u>Life Science</u>	