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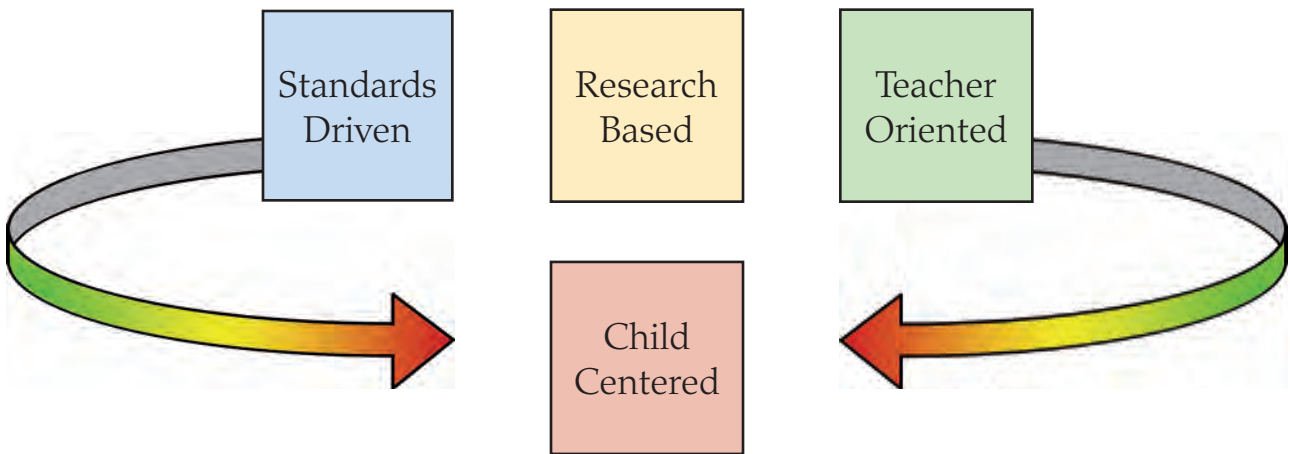
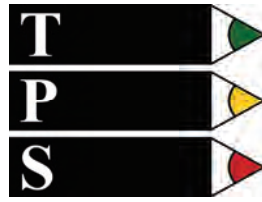
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Moving Science Education into the Twenty-First Century

“The California Science Standards are challenging. In the initial year of implementing the 2003 Science Framework for California Public Schools a major goal of most local educational agencies across the state is to facilitate the transition from what many students have traditionally been taught in science to the rigorous content presented in the California Science Standards. Instructional materials play a central role in facilitating that transition.”

(Extracted from The Criteria for Evaluating Instructional Materials in Science, p. 1).

TPS Curriculum aims to assist educators in making the transition from the twentieth to the twenty-first century, as purported by The California State Department of Education, by providing research-based curriculum materials grounded in cognitive theory and educational philosophy.



The Author
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Dear Teacher,

Welcome to Grade 5 Science!

I know that some of you may be a little worried about teaching science. Perhaps it is not your most favorite subject, or you may be a little rusty. Others of you will be raring to go and be fired up to start the year. I am sure your students will also be divided into varying levels of ability and confidence.

I would hope that you will all enjoy using our materials and find that we have provided you with everything you need to cover all of the Grade 5 California State Science Standards.

TPS has tried very hard to ensure that we meet the needs of all of you.

Without further ado, let's get going!

Good Luck!

The Author



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Purpose of the Guide

The purpose of the Teachers' Guide is to highlight and preview the components of the TPS curriculum materials, which have been designed by teachers and administrators in an effort to:

- provide elementary educators with research-based tools for teaching and learning science,
- facilitate the integration of a comprehensive program whereby educators will address more standards in less time,
- assist elementary teachers in the delivery, planning, and assessment of concepts and skills introduced in the science classroom,
- understand the rationale and research behind the design decisions made by the TPS Curriculum Team
- afford the elementary educator an opportunity to develop comfort with science as a content area and a way of thinking and learning.
- empower and equip educators with tools for teaching and learning which enhance teacher creativity
- utilize literacy as an avenue for learning

By using the TPS guide and the TPS Program, which we have specifically written for you, the California Science Teacher, we believe all of the required California Science Standards can be learned by all of your students. The Standards matrix shows the relevant pages in our Teacher Edition for your use

California Science Standards Matrix with TT and ST page references.

Standard	Lesson/Page Number	Type Of Hands-on Participation	
		Lab	Page ref
Standard Set 1. Physical Sciences		Lab	Page ref
Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept:	The individual lessons may take an average of 25 minutes depending upon the ability levels of the students and the way in which the teacher implements the materials. Teacher Textbook(TT)	Lab work averages between 30 and 45 minute periods	Student Textbook(ST)
a. Students know that during chemical reactions the atoms in the reactants rearrange to form products with different properties.	Teacher Information pages - Pre Standard.....	16 - 27	n/a
	A Letter to the Student	28	7
	The Story	29	8
	Key Words	29	8
	Chemical Reactions	30	9
	Memory Jiggler	30	9
	Focus Question.....	30	9
	Don't Be Tricked.....	34	13
	Focus Question.....	34	13
	Investigations - The Rusty Nail	35	14
	Dirty Money	36	15
	Test Practice Questions	37	16
	Science and Literacy Strategies	39	n/a
b. Students know all matter is made of atoms, which may combine to form molecules.	Teacher Information pages - Pre Standard.....	40 - 43	n/a
	The Story	44	17
	Key Words	44	17
	Focus Question.....	44	17
	Atoms	45	18
	Molecular Models.....	45	18
	Don't Be Tricked.....	46, 49	19, 22
	Focus Question	49	22
	Investigations - Molecules	50	23
	Gumdrop.....	51	24
	Test Practice Questions	52	25
	Science and Literacy Strategies	54	n/a
	c. Students know metals have properties in common, such as high electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni), copper (Cu), silver (Ag), and gold (Au), are pure elements; others, such as steel and brass, are composed of a combination of elemental metals.	Teacher Information pages - Pre Standard.....	55 - 58
The Story		59	26
Key Words		59	26
Properties of Metals.....		60	27
Focus Question.....		60, 62	28, 29
Alloys.....		62	29
Don't Be Tricked.....		63	30
Focus Question.....		63	30
Metals and Non-metals		64	31
Focus Question.....		64	31
Investigation - Identifying Metals and Non-metals.....		65	32
Test Practice Questions		66	33
Science and Literacy Strategies		68	n/a
d. Students know that each element is made of one kind of atom and that the elements are organized in the periodic table by their chemical properties.	Teacher Information pages - Pre Standard.....	69 - 71	n/a
	The Story	72	34
	Key Words	72	34
	Focus Question.....	72	34
	Elements.....	73	35
	Atomic Numbers	74	36
	Focus Question.....	74	36
	Periodic Table.....	75	37

	Memory Jiggler 76(II)		38(ST)
	Focus Question 77		39
	Separating Compounds 78		40
	Test Practice Questions 79		41
	Science and Literacy Strategies 81		n/a
e. Students know scientists have developed instruments that can create discrete images of atoms and molecules that show that the atoms and molecules often occur in well-ordered arrays.	Teacher Information pages - Pre Standard..... 83 - 84		n/a
	The Story 85		42
	Key Words 85		42
	Microscopes and Chemistry 86		43
	Focus Question 86		43
	Test Practice Questions 88		45
	Science and Literacy Strategies 89		n/a
f. Students know differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.	Teacher Information pages - Pre Standard..... 90 - 93		n/a
	The Story 94		46
	Key Words 94		46
	Compounds..... 95		47
	Focus Question 95,96		47, 48
	Mixtures..... 97		49
	Focus Question 97		49
	Ways of Separating Mixtures 98		50
	Focus Question 101	√	53
	Chemical Reactions 102		54
	Acids and Bases 103		55
	Focus Question 104		56
	Indicators..... 105		57
	Focus Question 106		58
	Investigation - Unknown Substance 107		59
	Test Practice Questions 109		61
	Science and Literacy Strategies 112		n/a
g. Students know properties of solid, liquid, and gaseous substances, such as sugar (C ₆ H ₁₂ O ₆), water (H ₂ O), helium (He), oxygen (O ₂), nitrogen (N ₂), and carbon dioxide (CO ₂).	Teacher Information pages - Pre Standard..... 113 - 117		n/a
	The Story 118		62
	Focus Question 118		62
	Key Words 119		63
	States of Matter..... 120		64
	Memory Jiggler 120		64
	Don't Be Tricked..... 122		66
	Focus Question 122		66
	Changing States of Matter..... 123		67
	Don't Be Tricked..... 124	√	68
	Memory Jiggler 124, 125		69, 69
	Focus Question 124, 126		68, 70
	Solutions of Gas..... 127		71
	Memory Jiggler 127, 129		71, 73
	Focus Question 128, 130		72, 74
	Investigation - Solutions..... 131		75
	Test Practice Questions 134		78
	Science and Literacy Strategies 136		n/a
h. Students know living organisms and most materials are composed of just a few elements.	Teacher Information pages - Pre Standard..... 137 - 138		n/a
	The Story 139		79
	Key Words 139		79
	Focus Question 139		79
	Structure of the Earth 140		80
	Memory Jiggler 140		80

	Focus Question.....	141(TT)		81(ST)
	Elements in Living Things	142		82
	Focus Question	143		83
	Investigation - Earth's Crust	144		84
	Test Practice Questions	146		86
	Science and Literacy Strategies	148		n/a
i. Students know the common properties of salts, such as sodium chloride (NaCl).	Teacher Information pages - Pre Standard.....	150 - 152		n/a
	The Story	153	√	87
	Key Words	153		87
	Focus Question.....	153		87
	Formulation of Salts	154		88
	Don't Be Tricked.....	154		88
	Uses of Salts	155		89
	Properties of Salt.....	156		90
	Focus Question.....	156		90
	Investigation - Ice Cream and Slippery Roads.....	157		91
	Test Practice Questions	161		95
	Science and Literacy Strategies	163		n/a
Standard Set 2. Life Sciences				
Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept:		Teacher Textbook		Student Textbook
a. Students know many multicellular organisms have specialized structures to support the transport of materials.	Teacher Information pages - Pre Standard.....	166 - 174		n/a
	A Letter to the Student	175		96
	The Story	176		97
	Key Words	176		97
	Transport in Animals.....	177		98
	Memory Jiggler	177		98
	Focus Question.....	177	√	98
	Transport in Plants.....	179		100
	Memory Jiggler	179		100
	Focus Question.....	179		100
	Investigation - Transport in Plants	180		101
	Test Practice Questions	182		103
	Science and Literacy Strategies	184		n/a
b. Students know how blood circulates through the heart chambers, lungs, and body and how carbon dioxide (CO ₂) and oxygen (O ₂) are exchanged in the lungs and tissues.	Teacher Information pages - Pre Standard.....	185 - 189		n/a
	The Story	190		104
	Key Words	190		104
	The Circulatory System	191		105
	Focus Question.....	191	√	105
	The Respiratory System	193		107
	Focus Question.....	194		108
	Investigation - Pulse Rate	195		109
	Test Practice Questions	199		113
	Science and Literacy Strategies	201		n/a
c. Students know the sequential steps of digestion and the roles of teeth and the mouth, esophagus, stomach, small intestine, large intestine, and colon in the function of the digestive system.	Teacher Information pages - Pre Standard.....	202 - 204		n/a
	The Story	205		114
	Focus Question.....	205		114
	Key Words	206		115
	The Process of Digestion.....	206		115
	Memory Jiggler	207, 208		116, 117
	Focus Question.....	207		116
	Test Practice Questions	209		118

	Science and Literacy Strategies210(TT)		n/a(ST)
d. Students know the role of the kidney in removing cellular waste from blood and converting it into urine, which is stored in the bladder.	Teacher Information pages - Pre Standard.....213 - 215		n/a
	The Story216		119
	Key Words216		119
	Focus Question.....216		119
	Memory Jiggler217		120
	Kidneys.....217		120
	Focus Question.....217		120
	Test Practice Questions221		122
	Science and Literacy Strategies222		n/a
e. Students know how sugar, water, and minerals are transported in a vascular plant.	Teacher Information pages - Pre Standard.....223 - 225		n/a
	The Story226		123
	Key Words226		123
	Focus Question.....226		123
	Transportation in Plants.....227		124
	Memory Jiggler227, 229, 230	√	124, 126, 127
	Focus Question.....227, 229		124, 126
	Tubes in Plants228		125
	Transpiration in Plants229		126
	Investigation - Celery Xylem231		128
	Test Practice Questions234		131
Science and Literacy Strategies236		n/a	
f. Student know plants use carbon dioxide (CO ₂) and energy from the sunlight to build molecules of sugar and release oxygen.	Teacher Information pages - Pre Standard.....237 - 239		n/a
	The Story240		132
	Key Words240		132
	Photosynthesis.....241		133
	Focus Question.....241		133
	Sugars and Starches243	√	135
	Memory Jiggler243		135
	Focus Question243		135
	Investigation - Did Photosynthesis Really Happen.....244		136
	Test Practice Questions248		140
	Science and Literacy Strategies251		n/a
g. Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO ₂) and water (respiration).	Teacher Information pages - Pre Standard.....252 - 254		n/a
	The Story255		141
	Key Words255		141
	Focus Question.....255		141
	Don't Be Tricked.....256	√	142
	The Chemistry of Cellular Respiration.....256		142
	Investigation - Respiration.....260		146
	Test Practice Questions262		148
	Science and Literacy Strategies264		n/a
Standard Set 3. Earth Sciences (Earth's Water)			
Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:	Teacher Textbook		Student Textbook
a. Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.	Teacher Information pages - Pre Standard.....266 - 269		n/a
	A Letter to the Student270		149
	The Story271		150
	Key Words271		150
	Focus Question.....271		150
	Fresh Water or Salt Water.....272		151
	Test Practice Questions273		152
	Science and Literacy Strategies274		n/a

b. Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.	Teacher Information pages - Pre Standard.....	275 - 277(II)	n/a(ST)
	The Story	278	153
	Focus Question	278	153
	Key Words	279	154
	Properties of Water	279	154
	Memory Jiggler	280	155
	The Water Cycle.....	281	156
	Don't Be Tricked.....	283	158
	Focus Question.....	283	158
	Investigation - Clouds in a Jar.....	284	159
	Test Practice Questions	288	163
	Science and Literacy Strategies	290	n/a
	c. Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.	Teacher Information pages - Pre Standard.....	292 - 293
The Story		294	164
Focus Question		294	164
Key Words		295	165
Clouds.....		295	165
Memory Jiggler		295	165
Precipitation		297	167
Memory Jiggler		297	167
Focus Question.....		298	168
Investigation - Collecting Weather Data		299	169
Test Practice Questions		302	172
Science and Literacy Strategies		305	n/a
d. Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.		Teacher Information pages - Pre Standard.....	306 - 308
	The Story	309	173
	Focus Question	309	173
	Key Words	310	174
	Sources of Water	310	174
	Memory Jiggler	311	175
	Distribution of Water.....	312	176
	Irrigation of Farmlands.....	313	177
	Focus Question.....	313	177
	Water Quality.....	314	178
	Focus Question.....	314	178
	Reduce, Reuse, Recycle	315	179
	Investigation - Water Quality	317	181
	Test Practice Questions	320	184
	Science and Literacy Strategies	322	n/a
e. Students know the origin of the water used by their local communities.	Teacher Information pages - Pre Standard.....	324 - 325	n/a
	The Story	326	185
	Focus Questions	326	185
	Memory Jiggler	326	185
	Key Words	327	186
	Background Information.....	327	186
	Memory Jiggler	328	187
	Your Task - Where Did it Come From?	329	188
	Science and Literacy Strategies	333	n/a

Standard Set 4. Earth Science (Weather)			
Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept:	Teacher Textbook		Student Textbook
a. Students know uneven heating of Earth causes air movements (convection currents).	Teacher Information pages - Pre Standard.....335 - 339 A Letter to the Student340 The Story341 Key Words341 Focus Question341 What's Sun Got to do With it?.....342 Memory Jiggler342 Uneven Heating.....343 Focus Question343 Memory Jiggler344 Don't Be Tricked.....344 Warm Air and Cold Air.....345 Convection Currents346 Focus Question346, 347 Test Practice Questions348 Science and Literacy Strategies349		n/a 192 193 193 193 194 194 195 195 196 196 197 198 198, 199 200 n/a
b. Students know the influence that the ocean has on weather and the role that the water cycle plays in weather patterns.	Teacher Information pages - Pre Standard.....350 -354 The Story355 Focus Question355 Key Words356 Convection Currents and Wind Belts.....357 Memory Jiggler357 Focus Question359 Memory Jiggler359 Ocean Currents.....360 El Niño.....361 Focus Question361 Memory Jiggler362 Test Practice Questions363 Science and Literacy Strategies364		n/a 201 201 202 203 203 204 204 206 207 207 208 209 n/a
c. Students know the causes and effects of different types of severe weather.	Teacher Information pages - Pre Standard.....365 - 368 The Story369 Focus Question369 Key Words370 Highs, Lows, and Fronts371 Memory Jiggler371, 372 Focus Question374 Storms375 Severe Weather375 Don't Be Tricked.....378 Test Practice Questions380 Science and Literacy Strategies381		n/a 210 210 211 212 212, 213 215 216 216 219 221 n/a
d. Students know how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.	Teacher Information pages - Pre Standard.....385 - 386 The Story387 Focus Question387 Key Words388 Forecasting Weather388 Don't Be Tricked.....389 Synoptic Weather Maps390 Memory Jiggler390 Station Model393	√	n/a 222 222 223 223 224 225 225 228

	Focus Question.....	394(TT)		229(ST)
	Investigation - Synoptic Weather Maps.....	395		230
	Test Practice Questions.....	399		234
	Science and Literacy Strategies.....	401		n/a
e. Students know that the Earth’s atmosphere exerts a pressure that decreases with distance above Earth’s surface and that at any point it exerts this pressure equally in all directions.	Teacher Information pages - Pre Standard.....	402 - 403		n/a
	The Story.....	404		235
	Key Words.....	404		235
	Focus Question.....	404		235
	Air Pressure.....	405		236
	Investigation - Air Pressure.....	405		236
	Altitude and Gravity.....	406		237
	Don’t Be Tricked.....	406		237
	Focus Question.....	406		237
	Air Pressure and Weather Conditions.....	407		238
	Test Practice Questions.....	408		239
	Science and Literacy Strategies.....	409		n/a
Standard Set 5. Earth Sciences (The Solar System)				
The solar system consists of planets and other bodies that orbit the Sun in predictable paths. As a basis for understanding this concept:		Teacher Textbook		Student Textbook
a. Students know the Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.	Teacher Information pages - Pre Standard.....	411 - 417		n/a
	A Letter to the Student.....	418		240
	The Story.....	419		241
	Focus Question.....	419		241
	Key Words.....	420		242
	The Sun.....	420		242
	Focus Question.....	421		243
	Test Practice Questions.....	422		244
	Science and Literacy Strategies.....	423		n/a
b. Students know the solar system includes the planet Earth, the Moon, the Sun, eight other planets and their satellites, and smaller objects, such as asteroids and comets.	Teacher Information pages - Pre Standard.....	424 - 426		n/a
	The Story.....	427		245
	Focus Question.....	427		245
	Key Words.....	428		246
	The Planets.....	428		246
	Memory Jiggler.....	430, 431, 433		248, 249, 251
	Accurate Information.....	435		253
	Other Objects in Space.....	436		254
	Memory Jiggler.....	436		254
	Don’t Be Tricked.....	437		255
	Focus Question.....	437		255
	Investigation - Feasibility Studies.....	438		256
	Test Practice Questions.....	440		258
	Science and Literacy Strategies.....	441		n/a
	c. Students know the path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.	Teacher Information pages - Pre Standard.....	442 - 443	
The Story.....		444		259
Key Words.....		444		259
Focus Question.....		444		259
The Sun and the Planets.....		445		260
How a Planet Stays in Orbit.....		446		261
Focus Question.....		446		261
Elliptical Orbits.....		447		262
Test Practice Questions.....		448		263
Science and Literacy Strategies.....		449		n/a

Standard Set 6. Investigation and Experimentation			
Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:	Infused in the chapters, refer to “Hands-on Participation” section		
a. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.	1c, 1f, 1h		
b. Develop a testable question.	1g, 1i, 2b, 2e, 2g, 3c		
c. Plan and conduct a simple investigation based in a student-developed question and write instructions others can follow to carry out the procedure.	1c, 1i, 2e, 2f, 2g, 3b, 3c		
d. Identify the dependent and controlled variables in an investigation.	1g, 1i, 2b		
e. Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.	1g, 1i, 2b		
f. Select appropriate tools (e.g., thermometers, metersticks, balances, and graduated cylinders) and make quantitative observations.	1a, 1c, 1g, 1i, 2a, 2e, 2f, 2g, 3b, 3c, 3d, 4e		
g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.	1c, 1i, 2a, 2b, 2e, 3b, 3c, 3d, 4d, 4e		
h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.	1a, 1c, 1i, 2a, 2e, 2f, 2g, 3b, 3c, 3d, 3e, 4d, 4e		
i. Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.	2a, 2e, 2f		

Overview of Chapters

Before we move into the detail of our products we thought it would be helpful to refresh all our memories and show an overview of what each standard in this year covers.

The Teacher’s and Student Textbook are organized in accordance with the sequence presented by the California Department of Education. The information provided below was compiled by referring to Chapter 3 of the Science Content Standards for Grade Five. The order of the chapters is as follows:

Chapter One — Standard Set 1 - Physical Sciences

Following the exposure to atoms and elements in third grade, grade five resumes this aspect of physical science through this study which is an introduction to chemical reactions. Students will learn that atoms combine to form molecules, and be able to distinguish between molecules, atoms, compounds, and mixtures. They receive an introduction to the Periodic Table of the Elements, and understand that its organization is related to trends and similarities in the chemical properties of the elements.

Chapter Two — Standard Set 2 - Life Sciences

Having been introduced to simple examples of the relationship between structures and functions in first grade, this standard continues the study of living things. Since the focus for first grade centered around the external aspects of adaptation, this area of study focuses on the internal structures and their functions. Students will learn about the internal structures of plants and animals and the vital functions they perform. Concepts in respiration, digestion, waste disposal, and transport of materials are included in the study.

Chapter Three — Standard Set 3 - Earth Sciences (Earth’s Water)

Fifth graders experience their first exposure to the hydrologic cycle, otherwise known as the water cycle. Through studying the way water moves between oceans and land, students will develop an understanding of the cooling processes of Earth’s atmosphere. They will learn about how water vapor returns to a liquid or solid state as, hail, sleet, or snow. They will be introduced to factors that contribute to weather-related phenomena.

Chapter Four — Standard Set 4 - Earth Sciences (Weather)

By referring to concepts learned in the previous chapter, students will continue learning about the hydrologic cycle and its affect on weather patterns. Large and small scale movements of water in the atmosphere will be studied.

Chapter Five — Standard Set 5 - Earth Sciences (The Solar System)

Understanding the organization and configuration of our Solar System is at the heart of this chapter. Students will be exposed to understanding and describing the relative motions of the planets. Having already had exposure to the concept of the Earth’s movement in space in relation to the Sun and Moon, students will study the composition of the Sun and the other components of the planets. The relationship between gravity and planetary orbits will be explored.

Chapter Six — Standard Set 6 - Investigation and Experimentation

The content of this standard is infused in the activities of each section of the Student Textbook. By exploring this standard, students will develop an understanding of formulating testable questions which are founded on factual information and based on observations. Students will work on designing experiments based on their observations and questions, while determining variables. Drawing conclusions and making written inferences are incorporated into the activities.