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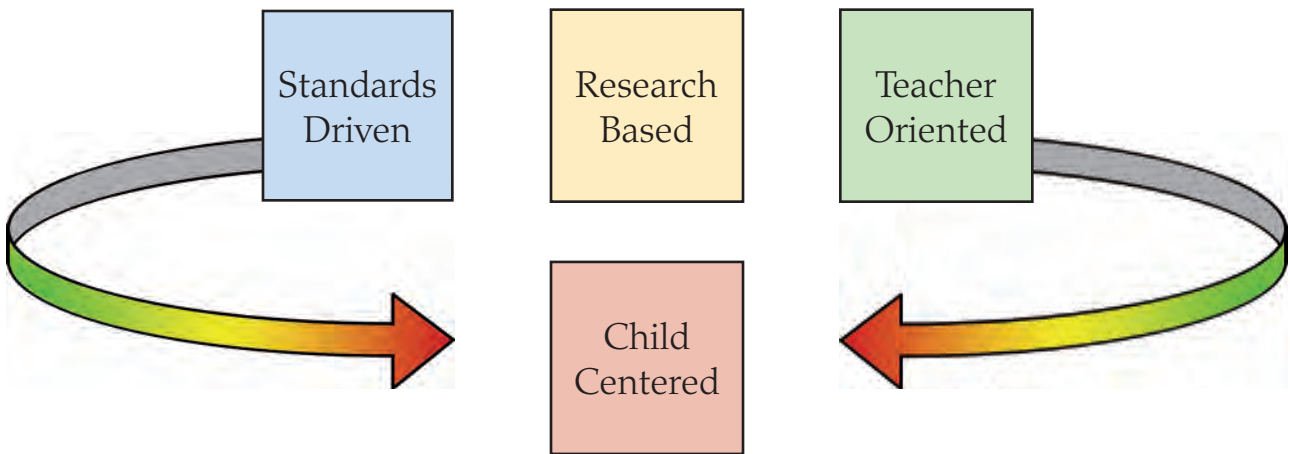
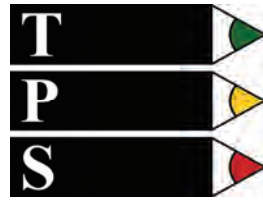
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Moving Science Education into the Twenty-First Century

“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 4 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 4 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			
Electricity and magnetism are related effects that have many useful applications in everyday life. 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 how to design and build simple series and parallel circuits by using components such as wires, batteries, and bulbs.	Teacher Information pages - Pre Standard.....16 - 23	√	n/a
	A Letter to the Student .....24		7
	The Story .....25		8
	Key Words .....25		8
	Focus Question .....25		8
	Parts of a Circuit .....26		9
	Types of Circuit.....27		10
	Focus Question .....27		10
	Building Circuits .....29		12
	Focus Question .....29		12
	Memory Jiggler .....30		13
	Procedure .....30 - 34		13 - 17
	Test Practice Questions .....35		18
Science and Literacy Strategies .....36	n/a		
b. Students know how to build a simple compass and use it to detect magnetic effects, including Earth's magnetic field.	Teacher Information pages - Pre Standard.....38 - 40	√	n/a
	The Story .....41		19
	Key Words .....41		19
	Focus Question .....41		19
	Magnets and Compasses .....42		20
	Memory Jiggler .....42		20
	Don't Be Tricked.....42		20
	Building a Compass.....43		21
	Test Practice Questions .....45		23
	Science and Literacy Strategies .....46		n/a
c. Students know electric currents produce magnetic fields and know how to build a simple electromagnet.	Teacher Information pages - Pre Standard.....47 - 49	√	n/a
	The Story .....50		24
	Key Words .....50		24
	Focus Question .....50		24
	Electric Current and Magnetic Fields.....51		25
	Memory Jiggler .....51, 52		25, 26
	Focus Question .....52		26
	Electromagnets - Building .....53		27
	Investigation - Electromagnets.....54		28
	Test Practice Questions .....55		29
	Science and Literacy Strategies .....56		n/a

d. Students know the role of electromagnets in the construction of electric motors, electric generators, and simple devices, such as doorbells and earphones.	Teacher Information pages - Pre Standard.....	57 - 59 (IT)	n/a (ST)
	The Story .....	.60	30
	Key Words .....	.60	30
	Focus Question .....	.60	30
	Electromagnets Everywhere .....	.61	31
	Doorbell.....	.61	31
	Electric Motors.....	.62	32
	Focus Question .....	.62	32
	Generators.....	.63	33
	Focus Question .....	.64	34
	Test Practice Questions .....	.65	35
Science and Literacy Strategies .....	.66	n/a	
e. Students know electrically charged objects attract or repel each other.	Teacher Information pages - Pre Standard.....	68 - 70	n/a
	The Story .....	.71	36
	Key Words .....	.71	36
	Focus Question .....	.71	36
	Atoms .....	.72	37
	Static Electricity.....	.74	39
	Investigation - Fun With Static.....	.75	40
	Review and Recheck.....	.77	42
	Test Practice Questions .....	.78	43
	Science and Literacy Strategies .....	.79	n/a
f. Students know that magnets have two poles (north and south) and that like poles repel each other while unlike poles attract each other.	Teacher Information pages - Pre Standard.....	80, 81	n/a
	The Story .....	.82	44
	Key Words .....	.82	44
	Focus Question .....	.82	44
	Magnets:		
	Poles on a Magnet .....	.83	45
	Magnetic Fields.....	.83	45
	Magnetic Forces.....	.83	45
	Memory Jiggler .....	.84	46
	Focus Question .....	.84	46
	Test Practice Questions .....	.85	47
Science and Literacy Strategies .....	.86	n/a	
g. Students know electrical energy can be converted to heat, light, and motion.	Teacher Information pages - Pre Standard.....	.87,88	n/a
	The Story .....	.89	48
	Key Words .....	.89	48
	Focus Question .....	.89	48
	Electrical Energy Converted to Light.....	.90	49
	Electrical Energy Converted to Heat.....	.90	49
	Electrical Energy Converted to Motion.....	.91	50
	Memory Jiggler .....	.92	51
	Test Practice Questions .....	.93	52
	Science and Literacy Strategies .....	.94	n/a

Standard Set 2. Life Sciences			
All organisms need energy and matter to live and grow. As a basis for understanding this concept:	Teacher Textbook(TT)		Student Textbook(ST)
a. Students know plants are the primary source of matter and energy entering most food chains.	Teacher Information pages - Pre Standard.....	97 - 103	n/a
	A Letter to the Student	104	53
	The Story	105	54
	Key Words	105	54
	Plants	106	55
	Focus Question	106,107	55, 56
	Animals	108	57
	Food Chains	109	58
	Focus Question	109	58
	Don't Be Tricked.....	110	59
	Focus Question	111	60
	Test Practice Questions	112	61
	Science and Literacy Strategies	113	n/a
b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.	Teacher Information pages - Pre Standard.....	114 - 118	n/a
	The Story	119	62
	Focus Question	119	62
	Key Words	120	63
	Getting the Words (and the Concepts) Straight.....	120	63
	Food Web.....	123	66
	Memory Jiggler	123	66
	Focus Question	123, 124	66, 67
	Investigation - Competition	125	68
	Test Practice Questions	128	71
Science and Literacy Strategies	130	n/a	
c. Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.	Teacher Information pages - Pre Standard.....	133 - 135	n/a
	The Story	136	72
	Key Words	136	72
	Focus Question	136	72
	What Happens to Dead Plants and Animals	137	73
	Memory Jiggler	138	74
	Focus Question	138	74
	Investigation - Mold Growth.....	139	75
	Test Practice Questions	144	80
	Science and Literacy Strategies	146	n/a

Standard Set 3. Life Sciences			
Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:		Teacher Textbook(TT)	Student Textbook(ST)
a. Students know ecosystems can be characterized by their living and nonliving components.	Teacher Information pages - Pre Standard.....	149 - 154	n/a
	A Letter to the Student	155	81
	The Story	156	82
	Focus Question	156	82
	Key Words	156	82
	Ecosystems	157	83
	Nonliving Things	157	83
	Memory Jiggler	157	83
	Don't Be Tricked	158	83
	Memory Jiggler	159	85
	Focus Question	159	85
	Test Practice Questions	160	86
	Science and Literacy Strategies	161	n/a
b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.	Teacher Information pages - Pre Standard.....	163 - 165	n/a
	The Story	166	87
	Focus Question	166	87
	Key Words	167	88
	Environments.....	167	88
	Memory Jiggler	168,170	89, 91
	Needs to be Met	170	91
	Focus Question	170	91
	Memory Jiggler	171	92
	Focus Question	173	94
	Movement	174	95
	Protection and Escape from Predators.....	175	96
	Test Practice Questions	178	99
Science and Literacy Strategies	179	n/a	
c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.	Teacher Information pages - Pre Standard.....	180 - 182	n/a
	The Story	183	100
	Focus Question	183	100
	Key Words	183	100
	Animals Depending on Plants	184	101
	Memory Jiggler	184	101
	Plants Depending on Animals.....	185	102
	Focus Question	185	102
	Memory Jiggler	186, 187	103, 104
	Focus Question	187, 188	104, 105
	Test Practice Questions	189	106
	Science and Literacy Strategies	190	n/a

d. Students know that most microorganisms do not cause disease and that many are beneficial.	Teacher Information pages - Pre Standard.....	193 - 197(TT)		n/a(ST)
	The Story	198		107
	Focus Question	198		107
	Key Words	199		107
	Harmful Microorganisms.....	199		108
	Extra Information.....	199		108
	Helpful Microorganisms	200	√	109
	Focus Question	200		109
	Memory Jiggler	201		110
	Focus Question	201		110
	Investigation - Protists	202		111
	Test Practice Questions	204		113
	Science and Literacy Strategies	205		n/a
Standard Set 4. Earth Science				
The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:		Teacher Textbook(TT)		Student Textbook(ST)
a. Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).	Teacher Information pages - Pre Standard.....	207 - 212		n/a
	A Letter to the Student	213		114
	The Story	214		115
	Focus Question	214		115
	Key Words	215		116
	Types of Rocks.....	215		116
	Igneous Rocks.....	215		116
	Focus Question	216		117
	Sedimentary Rocks.....	217	√	118
	Focus Question	218		119
	Metamorphic Rocks.....	219		120
	Focus Question	219		120
	Rock Cycle.....	220		121
Investigation - Rocks.....	221		122	
Test Practice Questions	224		125	
Science and Literacy Strategies	225		n/a	
b. Students know how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals by using a table of diagnostic properties.	Teacher Information pages - Pre Standard.....	226 - 229		n/a
	The Story	230		126
	Focus Question	230		126
	Key Words	230		126
	What is a Mineral?.....	231		127
	Identifying Minerals	231		127
	Don't Be Tricked.....	232	√	128
	Focus Question	234		130
	Reference Sheet	235		131
	Investigation - Minerals.....	236		132
	Test Practice Questions	238		134
	Science and Literacy Strategies	239		n/a

Standard Set 5. Earth Sciences			
Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:		Teacher Textbook(TT)	Student Textbook(ST)
a. Students know some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.	Teacher Information pages - Pre Standard.....	241 - 247	n/a
	A Letter to the Student	248	135
	The Story	249	136
	Focus Question	249	136
	Key Words	250	137
	Slow Changes to the Landscape	250	137
	Fast Changes to the Landscape.....	252	139
	Focus Question	252	139
	Memory Jiggler	254	141
	Don't Be Tricked.....	254	141
	Focus Question	256	143
	Test Practice Questions	257	144
	Science and Literacy Strategies	258	n/a
b. Students know natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.	Teacher Information pages - Pre Standard.....	261 - 263	n/a
	The Story	264	145
	Focus Question	264	145
	Key Words	264	145
	Physical Weathering	265	146
	Focus Question	266	147
	Chemical Weathering	267	148
	Biological Weathering.....	268	149
	Focus Question	268	149
	Investigation - Weathering	269	150
	Test Practice Questions	271	152
	Science and Literacy Strategies	273	n/a
	c. Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).	Teacher Information pages - Pre Standard.....	274 - 276	n/a
The Story		277	153
Focus Question		277	153
Key Words		278	154
Transportation by Water		278	154
Memory Jiggler		279	155
Focus Question		279	155
Changing the River Landscapes.....		280	156
Focus Question		280	156
Sediments and Soil.....		281	157
Memory Jiggler		281	157
Investigation - Deposition		282	158
Test Practice Questions		284	160
Science and Literacy Strategies	286	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 into each chapter, refer to “Types of Hands-on Participation”		
a. Differentiate observation from inference (interpretation) and know scientists’ explanations come partly from what they observe and partly from how they interpret their observations.	1e, 2b, 2c, 3d, 5b, 5c		
b. Measure and estimate the weight, length, or volume of objects.	2c, 3d, 4a		
c. Formulate and justify predictions based on cause-and-effect relationships.	1c, 1e, 1f, 2b, 2c, 3d, 5b		
d. Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.	1e, 2a, 2b, 2c, 3d, 5b		
e. Construct and interpret graphs from measurements.	2c, 3d, 4b, 5b		
f. Follow a set of written instructions for a scientific investigation.	1a, 1b, 1c, 1e, 2c, 3d, 4a, 4b, 5b, 5c		

Overview of Chapters

The Teachers' 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 Four. The order of the chapters is as follows:

Chapter One — Standard Set 1 - Physical Sciences (Electricity and Magnetism)

Electricity and magnetism are found in every aspect of our everyday life. Simple and parallel circuits allow us to function each day, and electromagnets can be found in transportation, communications, and in our homes. Through this unit, students will learn about how to make circuits and compasses, and about their uses. Electricity and magnetism are presented as practical science occurrences which permit people to have many comforts.

Chapter Two — Standard Set 2 - Life Sciences (Food Chains and Food Webs)

Living things in nature have a protocol for survival. There is a natural sequence in which living things consume one another for food and energy. These food chains and food webs preserve our ecosystems, and create an interdependence between populations of living things. Through this unit, students will learn about the relationships between plants and animals.

Chapter Three — Standard Set 3 - Life Sciences (Living and Nonliving Things)

Nonliving things are equally important to the survival of living things. The environment consists of air, water, soil, sunlight, climate and temperature which are all things that are essential for life. Animals depend on plants, and plants depend on animals for such things as pollination and seed dispersal. Students will learn about the interdependence of plants and animals, and nonliving aspects of the environment.

Chapter Four — Standard Set 4 - Earth Sciences (Rocks and Minerals)

The process by which rocks on Earth are made varies. The different processes make different rocks. Igneous, metamorphic, and sedimentary rocks are all formed due to different things happening in nature. The way in which a rock is formed determines how it is categorized. Students will study the various rock cycle scenarios, and understand how minerals are identified and analyzed.

Chapter Five — Standard Set 5 - Earth Sciences (Erosion and Weathering)

Volcanoes, earthquakes, landslides, and glaciers all cause Earth's appearance to change. Erosion and weathering cause Earth's landscape to become altered. Students will learn the various effects of these phenomena on the way Earth looks, and develop an understanding that changes to Earth happen both gradually and rapidly.

Standard Six — 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. Drawing conclusions and making written inferences are incorporated into the activities.