

**Prentice Hall Conceptual Integrated Science Explorations (Hewitt, et al) © 2010
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**Correlated to:
The Revised Washington State Science Standards, (12/14/2008)
(Grades 9-12)**

REVISED WASHINGTON STATE SCIENCE STANDARDS DECEMBER 14, 2008	CONCEPTUAL INTEGRATED SCIENCE EXPLORATIONS © 2010 / EBS © 2005
EALR 1: Systems (SYS)	
Core Content: Predictability and Feedback	
<p>In prior grades, students learned how to simplify and analyze complex situations by thinking about them as systems. In grades 9-12, students learn to construct more sophisticated system models, including the concept of feedback. Students are expected to determine whether or not systems analysis will be helpful in a given situation and if so, to describe the system, including subsystems, boundaries, flows, and feedbacks. The next step is to use the system as a dynamic model to predict changes. Students are also expected to recognize that even the most sophisticated models may not accurately predict how the real world functions. This deep understanding of systems and ability to use systems analysis is an essential tool both for scientific inquiry and for technological design.</p>	
Content Standards	
Students know that:	
<p>9-12 SYSA - Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.</p>	<p>SE/TE: 612-613, 847-850 TE only: 612, 848</p> <p>Event-Based Science: Representative Selections: <u>GOLD MEDAL!</u> 13-14 <u>BLACKOUT!</u> 14-15 <u>BLIGHT!</u> 35-36 <u>OIL SPILL!</u> 14 <u>EARTHQUAKE!</u> 25, 29, 34, 36-37 <u>GLOBAL WARMING!</u>: 9, 10-11, 45</p>
<p>9-12 SYSB - Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.</p>	<p>SE/TE: 63-66 TE only: 63, 65, 66</p> <p>Event-Based Science: Representative Selections: <u>OUTBREAK!</u> 46 <u>BLIGHT!</u> 18 <u>OIL SPILL!</u> 22-24 <u>TOXIC LEAK!</u> 17 <u>EARTHQUAKE!</u> 25, 29, 36</p>
	<p>TR: Minds-On Activities Book, "Third Law Sampler", Practice Book: "Nellie and Newton's Third Law"</p>

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9-12 SYSC - In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.	SE/TE: 4-5, 14, 64-66 TE only: 4,5, 63, 65, 66 Event-Based Science: Representative Selections: <u>BLIGHT!</u> 35-36 <u>OIL SPILL!</u> 14, 39 <u>EARTHQUAKE!</u> 23, 25, 29, 34, 36-37 <u>FIRE!</u> : 54-55 <u>BLACKOUT!</u> : 4-6, 13
	TR: Practice Book: "Making Hypotheses", Laboratory Manual: "Tuning the Senses", "Making Cents"
9-12 SYSD - Systems can be changing or in equilibrium.	SE/TE: 27-29, 63-64, 668 TE only: 27, 29, 668 Event-Based Science: Representative Selections: <u>BLACKOUT!</u> 14-15, 22-23 <u>FIRST FLIGHT!</u> 8-9 <u>THRILL RIDE!</u> 21-22, 36-37 <u>BLIGHT!</u> 35-36 <u>EARTHQUAKE!</u> 25, 29, 34, 36-37
	TR: Practice Book, "Newton's Third Law", "Static Equilibrium", "The Equilibrium Rule: $\Sigma F=0$ ", "Vectors and Equilibrium", Laboratory Manual: "Walking the Plank"
Performance Expectations	
Students are expected to:	
Give examples of a positive feedback system and explain its regulatory mechanism (e.g., global warming causes Earth's ice caps to melt, reflecting less energy to space, increasing temperatures). Give examples of a negative feedback system and explain its regulatory mechanism (e.g., when a human body overheats, it produces sweat that cools the body by evaporation).	SE/TE: 613, 662, 671, 847-850 TE only: 612, 662 Event-Based Science: Representative Selections: <u>GOLD MEDAL!</u> 13-14 <u>BLACKOUT!</u> 14-15 <u>BLIGHT!</u> 35-36 <u>OIL SPILL!</u> 14 <u>EARTHQUAKE!</u> 25, 29, 34, 36-37 <u>GLOBAL WARMING!</u> : 9-13, 16
	TR: Practice Book: "Exponential Growth and Logistic Growth"

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<p>Determine if a systems approach will be helpful in answering a question or solving a problem. Represent the system with a diagram specifying components, boundaries, flows, and feedbacks. Describe relevant subsystems and the larger system that contains the system being analyzed. Determine how the system functions with respect to other systems.</p>	<p>SE/TE: 63-66, 613, 671 TE only: 63, 65, 66, 612</p> <p>Event-Based Science: Representative Selections: <u>BLACKOUT!</u> 10-11,14-15 <u>FIRST FLIGHT!</u> 8-9, 16 <u>FLOOD!</u> 8-9, 13, 17-19 <u>TOXIC LEAK!</u> 17, 30 <u>EARTHQUAKE!</u> 25, 29, 36</p>
<p>Create a simplified model of a complex system. Trace the possible consequences of a change in one part of the system and explain how the simplified model may not be adequate to reliably predict consequences.</p>	<p>SE/TE: 63-66, 612-613 TE only: 63, 66, 612, 613</p> <p>Event-Based Science: Representative Selections: <u>FIRST FLIGHT!</u> 8-9, 16, 21 <u>THRILL RIDE!</u> 21-22, 28-29, 33, 38-39 <u>BLIGHT!</u> 35-36 <u>FLOOD!</u> 48-49 <u>OIL SPILL!</u> 14, 38, 43-44</p>
<p>Analyze whether or not a system (e.g., population) is changing or in equilibrium. Determine whether a state of equilibrium is static or dynamic (i.e., inflows equal outflows).</p>	<p>SE/TE: 27-33, 63-66 TE only: 27, 29, 31, 64, 65, 66</p> <p>Event-Based Science: Representative Selections: <u>BLACKOUT!</u> 14-15, 22-23 <u>FIRST FLIGHT!</u> 8-9 <u>THRILL RIDE!</u> 21-22, 36-37 <u>FLOOD!</u> 17-19 <u>EARTHQUAKE!</u> 25, 29, 36</p>
	<p>TR: : Practice Book, "Newton's Third Law", "Static Equilibrium", "The Equilibrium Rule: $\Sigma F=0$", Vectors and Equilibrium", Laboratory Manual: "Walking the Plank"</p>

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EALR 2: Inquiry (INQ)	
Core Content: Conducting Analyses and Thinking Logically	
<p>In prior grades, students learned to revise questions so they can be answered scientifically. In grades 9-12, students extend and refine their understanding of the nature of inquiry and their ability to formulate questions, propose hypotheses, and design, conduct, and report on investigations. Refinement includes an increased understanding of the kinds of questions that scientists ask and how the results reflect the research methods and the criteria that scientific arguments are judged by. Increased abilities include competence in using mathematics, a closer connection between student-planned investigations and existing knowledge, reflecting increased knowledge and improvements in communication and collaboration, and participation in a community of learners.</p>	
Content Standards	
Students know that:	
<p>9-12 INQA - Question - Scientists generate and evaluate questions to investigate the natural world.</p>	<p>SE/TE: 1, 3, 4-8, 11-14 TE only: 3, 5, 12, 13</p> <p>Event-Based Science: Representative Selections: <u>FIRE!</u> 12-13,16-17, 18-19,, 34-35, 58, 63 <u>BLIGHT!</u> 24, 38-39, 46 <u>GOLD MEDAL!</u> 36 <u>FIRST FLIGHT!</u> 17 <u>OUTBREAK!</u> 38</p>
	<p>TR: Practice Book, "Making Hypotheses", Minds-On Activities: "The World of Integrated Science"</p>
<p>9-12 INQB - Investigate - Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.</p>	<p>SE/TE: 1, 4-6, 13</p> <p>Event-Based Science: Representative Selections: <u>FLOOD!</u> 48-49 <u>SURVIVE!</u> 21, 30-31, 36-38, 48-49 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>GOLD RUSH!</u> 20, 28 <u>EARTHQUAKE!</u> 14-15</p>
	<p>TR: Minds-On Activities Book, "The Balancing Act", "Measuring Mass"</p>

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9-12 INQC - Explain - Conclusions must be logical, based on evidence, and consistent with prior established knowledge.	SE/TE: 1, 4-6, 13 Event-Based Science: Representative Selections: <u>FIRST FLIGHT!</u> 16, 21, 32-33 <u>FLOOD!</u> 20-21 <u>OIL SPILL!</u> 14, 22-24, 29, 38, 39, 43-44 <u>TOXIC LEAK!</u> 16, 20, 26-27, 34 <u>SURVIVE!</u> 21, 30-31, 36-38, 48-49
	TR: Practice Book, "Making Hypotheses"
9-12 INQD - Communicate Clearly - The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.	SE/TE: 1, 4-6, 13-14 TE only: 48 Event-Based Science: Representative Selections: <u>ASTEROID!</u> 10, 23-24, 42-43 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34 <u>GOLD RUSH!</u> 20, 28 <u>FLOOD!</u> 37
	TR: Practice Book, "Making Hypotheses", Minds-On Activities Book: "Write About It: Fission and Fusion", "Write About It: Electricity", "Write About it : Sound"
9-12 INQE - Model - The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.	SE/TE: 1, 4-8, 11-14 TE only: 4, 5, 6, 7, 8, 12, 13 Event-Based Science: Representative Selections: <u>FIRE!</u> 15, 40-41 <u>OUTBREAK!</u> 5, 38, 44-45 <u>FLOOD!</u> 10, 48-49 <u>OIL SPILL!</u> 14, 38, 39 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34
9-12 INQF - Communicate - Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.	SE/TE: 8-10 TE only: 8, 9 Event-Based Science: Representative Selections: <u>FRAUD!</u> 24 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34 <u>TOXIC LEAK!</u> 16 <u>GOLD RUSH!</u> 20-21 <u>FIRE!</u> 63

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	TR: Practice Book: "Making Hypotheses", Minds-On Activities Book: "Write About It: Fission and Fusion", "Write About It: Electricity", "Write About it: Sound"
9-12 INQG - Intellectual Honesty - Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings	SE/TE: 7 TE only: 7 Event-Based Science: Representative Selections: <u>OUTBREAK!</u> 44-45 <u>BLIGHT!</u> 10-11, 19, 27-28 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53, 63-64 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34
9-12 INQH - Intellectual Honesty - Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.	SE/TE: 7 TE only: 7 Event-Based Science: Representative Selections: <u>BLACKOUT!</u> 48-49, 52-53 <u>FLOOD!</u> 20-21 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53, 63-64 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34
Performance Expectations	
Students are expected to:	
Generate and evaluate a question that can be answered through a scientific investigation. Critique questions generated by others and explain whether or not the questions are scientific.	SE/TE: 1, 5, 16, 19 TE only: 4 Event-Based Science: Representative Selections: <u>OIL SPILL!</u> 14, 22-24, 29, 38, 39, 43-44 <u>TOXIC LEAK!</u> 34 <u>SURVIVE!</u> 36-38 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34
	TR: Practice Book: "About Science"

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Plan and conduct a scientific investigation, choosing a method appropriate to the question being asked. Collect, analyze, and display data using calculators, computers, or other technical devices when available.	SE/TE: 19 TE only: 4, 19 Event-Based Science: Representative Selections: <u>OIL SPILL!</u> 29, 43-44 <u>GLOBAL WARMING!</u> 25-26 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34 <u>SURVIVE!</u> 30 <u>FLOOD!</u> 48-49
Draw conclusions supported by evidence from the investigation and consistent with established scientific knowledge. Analyze alternative explanations and decide which best fits the data.	SE/TE: 4-6 Event-Based Science: Representative Selections: <u>BLIGHT!</u> 27-28, 35-36, 44 <u>OIL SPILL!</u> 14, 22-24, 29, 38, 39, 43-44 <u>TOXIC LEAK!</u> 16 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>OUTBREAK!</u> 30 <u>SURVIVE!</u> 21
	TR: Laboratory Manual: "Tuning the Senses", "Making Cents"
Write a detailed laboratory report that includes: the question that motivated the study, a justification for the kind of investigation chosen, hypotheses (if any), a description of what was done, a summary of data in tables and graphs, and a conclusion, based on the evidence, that responds to the question.	SE/TE: Can Be Developed From: 11-14 Event-Based Science: Representative Selections: <u>BLIGHT!</u> 10-11, 19, 35-36 <u>OIL SPILL!</u> 14, 22-24, 29, 38, 39, 43-44 <u>ASTEROID!</u> 10 <u>TOXIC LEAK!</u> 20, 26-27, 34 <u>VOLCANO!</u> 14-15, 60 <u>TORNADO!</u> 54
Formulate one or more hypotheses based on a model or theory of a causal relationship. Demonstrate creativity and critical thinking to formulate and evaluate the hypotheses.	SE/TE: 4-5, 14, 16 TE only: 4 Event-Based Science: Representative Selections: <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53 <u>FLOOD!</u> 10, 20-21, 48-49 <u>OIL SPILL!</u> 38 <u>TOXIC LEAK!</u> 16, 20, 26-27, 34 <u>ASTEROID!</u> 10, 23-24, 42-43 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34
	TR: Practice Book: "Making Hypotheses"

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<p>Evaluate an investigation to determine if it was a valid means of answering the question, and whether or not the results were reliable. Describe the development of a scientific theory that illustrates logical reasoning, creativity, testing, revision, and replacement of prior ideas in light of new evidence.</p>	<p>SE/TE: 6, 16 TE only: 4</p> <p>Event-Based Science: Representative Selections: FIRST FLIGHT! 8-9, 16, 21 OUTBREAK! 44-45 TOXIC LEAK! 16, 20, 26-27, 34 ASTEROID! 10, 23-24, 42-43 HURRICANE! 20-21</p>
	<p>TR: Minds-On Activities: "The Balancing Act", "Measuring Mass"</p>
<p>Participate in a scientific discussion about their own investigations and those performed by others. Respond to questions and criticisms, and if appropriate, revise explanations based on these discussions.</p>	<p>SE/TE: 6, 11-14</p> <p>Event-Based Science: Representative Selections: BLIGHT! 19 OIL SPILL! 29 TOXIC LEAK! 20, 34 EARTHQUAKE! 14-15, 23, 29, 34 OUTBREAK! 5</p>
	<p>TR: Minds-On Activities Book: "The World of Integrated Science"</p>
<p>Provide appropriate citations for all ideas, findings, and information used in any and all written reports. Explain the consequences for failure to provide appropriate citations.</p>	<p>SE/TE: 6, 16 TE only: 6</p> <p>Event-Based Science: Representative Selections: FLOOD! 20-21 OIL SPILL! 22-24 TOXIC LEAK! 26-27 ASTEROID! 23-24 EARTHQUAKE! 14-15, 23, 29, 34</p>

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EALR 3: Application (APP)	
Core Content: Science, Technology, and Society	
<p>In prior grades, students learn to work with other members of a team to apply the full process of technological design and relevant science concepts to solve problems. In grades 9-12, students apply what they have learned to address societal issues and cultural differences. Students learn that science and technology are interdependent, that science and technology influence society, and that society influences science and technology. Students continue to increase their abilities to work with other students and to use mathematics and information technologies (when available) to solve problems. They transfer insights from those increased abilities to considering local, regional, and global issues. These insights and capabilities will help prepare students to solve societal and personal problems in future years.</p>	
Content Standards	
Students know that:	
<p>9-12 APPA - Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study, and by deciding what research will be funded.</p>	<p>SE/TE: 2-3, 6, 8-10, 169, 188, 279, 305-306, 533, 581, 643, 667, 712, 770, 836, 840, 887 TE only: 288</p> <p>Event-Based Science: Representative Selections: <u>OIL SPILL!</u> 2, 31-33, 40 <u>TOXIC LEAK!</u> 2-3, 6-7, 10-11, 18-19, 35 <u>SURVIVE!</u> 2, 6, 9, 14, 15, 16, 19, 24-25, 26, 28 <u>GLOBAL WARMING!</u> 14, 15, 27-28, 29-30, 58 <u>EARTHQUAKE!</u> 6-9, 23, 30, 34 <u>OUTBREAK!</u>: 46</p>
	<p>TR: Minds-On Activities Book: "The Nuclear Power Debate"</p>
<p>9-12 APPB - The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.</p>	<p>SE/TE: Can Be Developed From: 6-10, 12-13, 164, 199, 207, 268, 291, 304-305, 520, 711 TE only: Can Be Developed From: 9, 305</p> <p>Event-Based Science: Representative Selections: <u>THRILL RIDE!</u> 11-12, 21-22, 25-33, 28-29 <u>FLOOD!</u> 20-21, 39 <u>TOXIC LEAK!</u> 33, 34 <u>ASTERIOD!</u> 50-51 <u>EARTHQUAKE!</u> 25, 29, 34, 36, 41</p>

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9-12 APPC - Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.	SE/TE: 9-10 TE only: 9 Event-Based Science: Representative Selections: <u>FIRE!</u> 15, 40-41 <u>FIRST FLIGHT!</u> 16 <u>TOXIC LEAK!</u> 33, 34 <u>ASTERIOD!</u> 50-51 <u>EARTHQUAKE!</u> 25, 29, 34, 36, 41
9-12 APPD - The ability to solve problems is greatly enhanced by use of mathematics and information technologies.	SE/TE: 3, 23, 29, 39, 45, 101, 115, 118, 416, 666-668, 864, 886 TE only: 3, 666 Event-Based Science: Representative Selections: <u>BLIGHT!</u> 52, 53 <u>SURVIVE!</u> 32-33, 58, 59 <u>VOLCANO!</u> 57, 59 <u>BLACKOUT!</u> 60-61 <u>TORNADO!</u> 54
	TR: Minds-On Activities Book: "What is Scientific Notation?", "Problem Solving with Scientific Notation", "Measuring Volume"
9-12 APPE - Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended others not.	SE/TE: 7, 9-10 TE only: 9 Event-Based Science: Representative Selections: <u>GOLD MEDAL!</u> 34-35 <u>BLACKOUT!</u> 10-11, 14-15, 26-27 <u>FLOOD!</u> 39 <u>EARTHQUAKE!</u> 14-15, 23, 29, 34 <u>ASTERIOD!</u> 50-51
9-12 APPF - It is important for all citizens to apply science and technology to critical issues that influence society.	SE/TE: 7-10 TE only: 9 Event-Based Science: Representative Selections: <u>TOXIC LEAK!</u> 2-3, 6-7, 35 <u>SURVIVE!</u> 2, 6, 9, 14, 15, 16, 19, 24-25, 26, 28, 32-33 <u>EARTHQUAKE!</u> 6-9, 23, 30, 34 <u>OUTBREAK!</u> 3, 34 <u>FLOOD!</u> 50 <u>BLIGHT!</u> 38

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Performance Expectations	
Students are expected to:	
Describe ways that scientific ideas have influenced society or the development of differing cultures. List questions that scientists investigate that are stimulated by the needs of society (e.g., medical research, global climate change).	<p>SE/TE: 3, 6, 8-10, 20-21, 22, 25, 25-26, 28-29, 32-33, 39, 45, 49, 93, 113, 115, 134, 135, 136, 157, 161-162, 169, 186, 188, 189, 196, 210, 226-227, 249, 253, 261, 262, 279, 329, 481, 526-528, 533, 542, 545-546, 571, 581, 643, 652, 667, 682-683, 712, 770, 834, 836, 840, 845, 887</p> <p>TE only: 20, 21, 32, 33, 40, 41, 45, 48, 113, 158, 160, 185, 186, 189, 221, 253, 262, 527, 682</p> <p>Event-Based Science: Representative Selections: <u>OUTBREAK!</u> 6, 10, 16, 17-18, 24, 31, 32-33, 46, 47 <u>BLIGHT!</u> 15, 24, 25, 36, 38-39, 42, 46, 48 <u>GLOBAL WARMING!</u> 14, 15, 27-28, 58 <u>EARTHQUAKE!</u> 6-9, 23, 30, 34 <u>TOXIC LEAK!</u> 41-44 <u>EARTHQUAKE!</u> 26-28</p>
	TR: Minds-On Activities Book: "Discovering the Discoverers", "The Nuclear Power Debate"
Work collaboratively with other students to generate ideas for solving a problem. Identify criteria and constraints, research the problem, and generate several possible solutions.	<p>SE/TE: Can Be Developed From: 16, 35-36, 55, 72-73, 88-89, 109-110, 125-127, 131, 165, 172, 191-192, 256-258, 274-275, 298- 299, 325-326, 354-355, 378-379, 402-403, 431-432, 468-469, 489, 506, 521-522, 539-540, 567-568, 593-594, 621-622, 645-646, 670-671, 696-697, 725-726, 750-751, 772, 773, 805, 828-829, 852-853, 880-881, 898</p> <p>TE only: Can Be Developed From: 27, 29, 31, 39, 40, 41, 47, 50, 58, 76, 93, 96, 115, 116, 123, 124, 135, 142, 165, 168, 218, 220, 239, 295, 334, 346, 415, 464, 485, 487, 496, 519, 525, 668, 683, 687, 690, 689, 690, 708, 735, 795, 813</p> <p>Event-Based Science: Representative Selections: <u>BLIGHT!</u> 35-36 <u>OIL SPILL!</u> 22-24, 38 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53 <u>EARTHQUAKE!</u> 6-9, 14-15, 23, 29, 34, 41 <u>OUTBREAK!</u> 5 <u>SURVIVE!</u> 11</p>

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<p>Choose the best solution for a problem, create a model or drawing of the final design, and devise a way to test it. Redesign the solution, if necessary, then present it to peers.</p>	<p>SE/TE: Can Be Developed From: 16, 35-36, 55, 72-73, 88-89, 109-110, 125-126, 131, 172, 191-192, 256-258, 274-275, 298-299, 325-326, 354-355, 378-379, 402-403, 431-432, 468-469, 489, 506, 539-540, 567-568, 593-594, 670-671, 696-697, 750-751, 772-773, 805, 828-829, 852-853, 880-881, 898</p> <p>TE only: Can Be Developed From: 27, 29, 31, 39, 40, 41, 47, 50, 58, 76, 93, 96, 115, 116, 123, 124, 135, 142, 165, 168, 218, 220, 239, 295, 334, 346, 415, 464, 485, 487, 496, 519, 525, 668, 683, 687, 690, 689, 690, 708, 735, 795, 813</p> <p>Event-Based Science: Representative Selections: <u>BLIGHT!</u> 35-36 <u>OIL SPILL!</u> 22-24, 38 <u>GLOBAL WARMING!</u> 8, 25-26, 41-42, 53 <u>EARTHQUAKE!</u> 6-9, 14-15, 23, 29, 34, 41 <u>OUTBREAK!</u>: 5 <u>SURVIVE!</u>: 11</p>
<p>Use proportional reasoning, functions, graphing, and estimation to solve problems. Use computers, probes, and software when available to collect, display, and analyze data.</p>	<p>SE/TE: 16, 23, 35, 36, 37, 43, 45, 47, 49, 50, 53-56, 67, 72-74, 89, 93, 96, 97, 99, 111-112, 115, 116-117, 118, 129-132, 138, 152-153, 162 167, 187, 191-192, 256-258, 274-275, 298-299, 325-326, 354-355, 378-379, 402-403, 431-432, 468-469, 489, 506, 539-540, 567-568, 593-594, 670-671, 696-697, 750-751, 772-773, 805, 828-829, 852-853, 880-881, 898</p> <p>TE only: 40, 41, 74, 76, 77, 116, 117, 286, 292, 294, 414, 415</p> <p>Event-Based Science: Representative Selections: <u>OIL SPILL!</u> 22-24, 45 <u>ASTERIOD!</u> 42-43, 50-51, 51-52 <u>GLOBAL WARMING!</u> 27-28, 60, 61-62 <u>EARTHQUAKE!</u> 29, 41, 43 <u>GOLD RUSH!</u>: 20 <u>HURRICANE!</u>: 52</p>
	<p>TR: Practice Book: "A Day at the Races with Newton's Second Law", "Inverse-Square Law-Weight", Minds-On Activities: "Making Distance-Time Graphs", Laboratory Manual: "Work-Force x Distance"</p>

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<p align="center">REVISED WASHINGTON STATE SCIENCE STANDARDS DECEMBER 14, 2008</p>	<p align="center">CONCEPTUAL INTEGRATED SCIENCE EXPLORATIONS © 2010 / EBS © 2005</p>
<p>Analyze a societal issue that may be addressed through science and/or technology. Compare alternative solutions by considering trade-offs and unintended consequences (e.g., removing dams to increase salmon spawning).</p>	<p>SE/TE: Can Be Developed From: 16, 105, 128, 156, 181, 277, 279, 281, 291, 296, 424-425, 520, 533, 847-850 TE only: Can Be Developed From: 281, 291, 296, 425, 520, 848</p> <p>Event-Based Science: Representative Selections: <u>FIRE!</u> 12-13, 18-19, 20-22, 34-35 <u>BLIGHT!</u> 36, 38-39, 42, 48 <u>FLOOD!</u> 1-2, 23 <u>TOXIC LEAK!</u> 2-3, 6-7, 33, 35 <u>SURVIVE!</u> 14, 32-33 <u>OUTBREAK!</u> 5, 6, 10, 16, 17-18, 24, 31, 32-33, 47</p>
<p>Critically analyze scientific information in current events to make personal choices, or to inform public-policy decisions.</p>	<p>SE/TE: Can Be Developed From: 16, 105, 128, 164, 277, 281, 286-287, 291, 296, 424-425, 520, 533, 545, 847-850 TE only: Can Be Developed From: 281, 287, 288, 291, 296, 425, 520, 533, 848</p> <p>Event-Based Science: Representative Selections: <u>FLOOD!</u> 1-2, 28, 50 <u>OIL SPILL!</u> 31-33, 39, 40 <u>OUTBREAK!</u> 6, 10, 16, 17-18, 24, 31, 32-33, 47 <u>TOXIC LEAK!</u> 2-3, 6-7, 34, 35 <u>GLOBAL WARMING!</u> 14, 15, 58</p>

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EALR 4: Physical Science	
Big Idea: Force and Motion (PS1)	
Core Content: Newton's Laws	
<p>In prior grades, students learned to measure, record, and calculate the average speed of objects, and to tabulate and graph the results. In grades 9-11, students learn to apply Newton's Laws of Motion and Gravity both conceptually and quantitatively. Students are able to calculate average speed, velocity, and acceleration. Students also develop an understanding of forces due to gravitational and electrical attraction. These fundamental concepts enable students to understand the forces that govern the observable world and provide a foundation for a full course in physics.</p>	
Content Standards	
Students know that:	
<p>9-11 PS1A - Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction.</p>	<p>SE/TE: 22-25</p> <p>Event-Based Science: <u>FIRE!</u> 47-48, 59, 67, 68-69 <u>FIRST FLIGHT!</u> 5, 13, 21, 23-24, 28, 39, 40, 41, 48 <u>GOLD MEDAL!</u> 27, 28, 36, 37-38 <u>ASTEROID!</u> 20, 42-43, 51-52 <u>HURRICANE!</u> 1-2, 3, 4, 8-9, 15-16, 20-22 <u>FLOOD!</u> 52-53 <u>THRILL RIDE!</u> 1-2, 4-5, 6, 11-12, 21-22, 28-29, 36-37, 38-40, 43, 49 <u>TORNADO!</u> 19-20, 52-53, 59-60</p>
	<p>TR: Laboratory Manual: "Sonic Ranger"</p>
	<p>TECH: Student CD: Ch2_AverageSpeed_VID.mov, Ch2_Velocity_VID.mov</p>
<p>9-11 PS1B - Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction.</p>	<p>SE/TE: 38-42 TE only: 40, 41</p> <p>Event-Based Science: <u>FIRE!</u> 47-48, 59, 67, 68-69 <u>FIRST FLIGHT!</u> 5, 13, 21, 23-24, 28, 39, 40, 41, 48 <u>GOLD MEDAL!</u> 27, 28, 36, 37-38 <u>ASTEROID!</u> 20, 42-43, 51-52 <u>HURRICANE!</u> 1-2, 3, 4, 8-9, 15-16, 20-22 <u>FLOOD!</u> 52-53 <u>THRILL RIDE!</u> 1-2, 4-5, 6, 11-12, 21-22, 23, 28-29, 36-37, 38-40, 43, 49 <u>TORNADO!</u> 19-20, 52-53, 59-60</p>

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	TR: Practice Book: "Free Fall Speed", "Acceleration of Free Fall"
	TECH: Student CD: Ch3_FreeFallAccelerat_VID.mov
9-11 PS1C - An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's 1st Law of Motion, the =Law of Inertia)	SE/TE: 42-43 TE only: 43 Event-Based Science: <u>THRILL RIDE!</u> 4-5, 11-12, 14, 17, 23, 24, 30-31, 40, 52
	TR: Practice Book: "Static Equilibrium", "The Equilibrium Rule: $\Sigma F = 0$ ", Laboratory Manual: "Go! Go! Go!", Minds-On Activities Book: "On a Roll", Making Distance-Time Graphs", "First Law Fun"
	TECH: Student CD: Ch2_NewtonsLawofInertia_VID.mov
9-11 PS1D - A net force will cause an object to accelerate or change direction. A less massive object will speed up more quickly than a more massive object subjected to the same force. (Newton's 2nd Law of Motion, $F=ma$)	SE/TE: 39-41 TE only: 41 Event-Based Science: <u>THRILL RIDE!</u> 4-5, 11-12, 14, 17, 23, 24, 30-31, 36-37, 38-39, 40, 41-42, 49, 52 <u>GOLD MEDAL!</u> 29 <u>ASTEROID!</u> 10, 11
	TR: Practice Book: "A Day at the Races with Newton's Second Law: $a = F/m$ "
	TECH: Student CD: Ch3_Newtons2ndLaw_VID.mov
9-11 PS1E - Whenever one object exerts a force on another object, a force of equal magnitude is exerted on the first object in the opposite direction. (Newton's 3rd Law of Motion)	SE/TE: 57-70 Event-Based Science: <u>THRILL RIDE!</u> 4-5, 11-12, 14, 17, 23, 24, 40, 47, 52 <u>GOLD MEDAL!</u> 26, 28-29, 34-35
	TR: Practice Book: "Newton's Third Law", "Nellie and Newton's Third Law", Laboratory Manual: "Putting the Force Before the Cart" Minds-On Activities Book: "Great Minds in Motion"

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	TECH: Student CD: Ch4_ActionAndReactionOn_VID.mov
9-11 PS1F - Gravitation is a universal attractive force by which objects with mass attract one another. The gravitational force between two objects is proportional to their masses and inversely proportional to the square of the distance between the objects. (Newton’s Law of Universal Gravitation)	SE/TE: 115-128 Event-Based Science: <u>THRILL RIDE!</u> 14, 16, 24, 32, 36-37, 47 <u>FIRST FLIGHT!</u> 8-9, 21, 23 <u>FRAUD!</u> 9-10 <u>TORNADO!</u> 6 <u>EARTHQUAKE!</u> 41 <u>ASTEROID!</u> 11, 22 <u>OIL SPILL!</u> 25
	TR: Practice Book: “Ocean Tides”
	TECH: Student CD: Ch7_InverseSquareLaw_VID.mov
9-11 PS1G - Electrical force is a force of nature, independent of gravity that exists between charged objects. Opposite charges attract while like charges repel.	SE/TE: 157, 333 Event-Based Science: <u>BLACKOUT!</u> 3, 7, 21, 32, 38, 54 <u>TORNADO!</u> 38
	TR: Practice Book: “Coulomb’s Law”, “Magnetic Fundamentals”
9-11 PS1H - Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.	SE/TE: 180, 186-189 TE only: 186, 187, 188 Event-Based Science: <u>FRAUD!</u> 28-29 <u>BLACKOUT!</u> 7, 9, 26-27, 30, 31, 32, 34-35, 54
	TR: Practice Book: “Magnetic Fundamentals”, “Electromagnetism”
	TECH: Student CD: Ch10_FaradaysLaw_VID.mov

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Performance Expectations	
Students are expected to:	
<p>Calculate the average velocity of a moving object, given the object's change in position and time. ($v = \frac{x_2 - x_1}{t_2 - t_1}$) Explain how two objects moving at the same speed can have different velocities.</p>	<p>SE/TE: 23</p> <p>Event-Based Science: <u>FIRE!</u> 47-48, 59, 67, 68-69 <u>FIRST FLIGHT!</u> 5, 13, 21, 23-24, 28, 39, 40, 41, 48 <u>GOLD MEDAL!</u> 27, 28, 36, 37-38 <u>ASTEROID!</u> 20, 42-43, 51-52 <u>HURRICANE!</u> 1-2, 3, 4, 8-9, 15-16, 20-22 <u>FLOOD!</u> 52-53 <u>THRILL RIDE!</u> 1-2, 4-5, 6, 11-12, 21-22, 28-29, 36-37, 38-40, 43, 49 <u>TORNADO!</u> 19-20, 52-53, 59-60</p>
	TR: Laboratory Manual: "Sonic Ranger"
	TECH: Student CD: Ch2_AverageSpeed_VID.mov
<p>Calculate the average acceleration of an object, given the object's change in velocity with respect to time. ($a = \frac{v_2 - v_1}{t_2 - t_1}$) Explain how an object moving at constant speed can be accelerating.</p>	<p>SE/TE: 39-40 TE only: 40</p> <p>Event-Based Science: <u>FIRE!</u> 47-48, 59, 67, 68-69 <u>FIRST FLIGHT!</u> 5, 13, 21, 23-24, 28, 39, 40, 41, 48 <u>GOLD MEDAL!</u> 27, 28, 36, 37-38 <u>ASTEROID!</u> 20, 42-43, 51-52 <u>HURRICANE!</u> 1-2, 3, 4, 8-9, 15-16, 20-22 <u>FLOOD!</u> 52-53 <u>THRILL RIDE!</u> 1-2, 4-5, 6, 11-12, 21-22, 23, 28-29, 36-37, 38-40, 43, 49 <u>TORNADO!</u> 19-20, 52-53, 59-60</p>
	TR: Practice Book: "Free Fall Speed", "Acceleration of Free Fall"
	TECH: Student CD: Ch3_ChangingVelocity_VID.mov, Ch3_DefinitionOfAccel_VID.mov
<p>Given specific scenarios, compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces.</p>	<p>SE/TE: 31-33, 45-47, 54-55</p> <p>Event-Based Science: <u>THRILL RIDE!</u> 4-5, 11-12, 14, 17, 23, 24, 30-31, 40, 52</p>

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	TR: Practice Book: "Dropping Masses And Accelerating Cart"
Predict how objects of different masses will accelerate when subject to the same force. Calculate the acceleration of an object, given the object's mass and the net force on the object, using Newton's 2nd law of Motion ($F=ma$).	SE/TE: 38-41, 44-46 TE only: 38, 39, 41, 46, 47 Event-Based Science: <u>THRILL RIDE!</u> 4-5, 11-12, 14, 17, 23, 24, 30-31, 36-37, 38-39, 40, 41-42, 49, 52 <u>GOLD MEDAL!</u> 29 <u>ASTEROID!</u> 10, 11
	TR: Practice Book: "Dropping Masses And Accelerating Cart", Minds-On Activities Book: "Another Look at Mass and Acceleration", "Great Minds in Motion", Laboratory Manual: "Putting the Force Before the Cart"
Illustrate with everyday examples that for every action there is an equal and opposite reaction (e.g., a person exerts the same force on the Earth as the Earth exerts on the person).	SE/TE: 57-70 TE only: 57, 58, 59, 60 Event-Based Science: <u>THRILL RIDE!</u> 4-5, 11-12, 14, 17, 23, 24, 40, 47, 52 <u>GOLD MEDAL!</u> 26, 28-29, 34-35
	TR: Practice Book: "Newton's Third Law"
	TECH: Student CD: Ch3_ForcesAndInteract_VID.mov
Predict how the gravitational force between two bodies would differ for bodies of different masses or different distances apart. Explain how the weight of an object can change while its mass remains constant.	SE/TE: 42-44, 113, 115, 117, 118 TE only: 43, 62, 115, 117 Event-Based Science: <u>THRILL RIDE!</u> 14, 16, 23, 24, 32, 36-37, 38, 40, 47 <u>FIRST FLIGHT!</u> 8-9, 21, 23 <u>FRAUD!</u> 9-10 <u>TORNADO!</u> 6 <u>EARTHQUAKE!</u> 41 <u>ASTEROID!</u> 11, 22 <u>OIL SPILL!</u> 25
	TR: Practice Book: "Inverse-Square Law - Weight"

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Predict whether two charged objects will attract or repel each other, and explain why.	SE/TE: 155-156, 333 TE only: 156 Event-Based Science: <u>BLACKOUT!</u> 3, 21, 26-27, 30-35, 38, 54 <u>TORNADO!</u> 38
	TR: Practice Book: "Types of Chemical Bonds", Minds-On Activities Book: "Write About It: Electricity", Laboratory Manual: "A Force to Be Reckoned"
	TECH: Student CD: Ch17_IonicBonds.swf
Demonstrate and explain that an electric current flowing in a wire will create a magnetic field around the wire (i.e., electromagnetic effect). Demonstrate and explain that moving a magnet near a wire will cause an electric current to flow in the wire (i.e., the generator effect).	SE/TE: 183-189, 190-192 TE only: 180, 181, 186, 187, 188 Event-Based Science: <u>FRAUD!</u> 28-29 <u>BLACKOUT!</u> 7, 9, 26-27, 30, 30-35, 54
	TR: Practice Book: "Magnetic Fundamentals", "Electromagnetism", Minds-On Activities Book: "Electricity from Magnetism", Laboratory Manual: "Generator Activity"
	TECH: Student CD: Ch10_FaradaysLaw_VID.mov, Ch10_MagneticForcesOn_VID.mov

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EALR 4: Physical Science	
Big Idea: Matter: Properties and Change (PS2)	
Core Content: Chemical Reactions	
<p>In prior years, students learned the basic concepts behind the atomic nature of matter. In grades 9-11, students learn about chemical reactions, starting with the structure of an atom. They learn that the Periodic Table groups elements with similar physical and chemical properties. With grounding in atomic structure, students learn about the formation of molecules and ions, compounds and solutions, and the details of a few common chemical reactions. They also learn about nuclear reactions and the distinction between fusion and fission. These concepts about the fundamental properties of matter will help students understand chemical reactions that are important in modern society and lay the groundwork for both chemistry and life science.</p>	
Content Standards	
Students know that:	
<p>9-11 PS2A - Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge.</p>	<p>SE/TE: 261-263, 267-268 TE only: 263</p> <p>Event-Based Science: <u>FRAUD!</u> 9, 10 <u>BLACKOUT!</u>: 7</p>
	<p>TR: Practice Book: "Subatomic Particles", Minds-On Activities Book: "Visualizing the Invisible", "Wheeling Electrons", Laboratory Manual: "Thickness of a BB pancake", "Oleic Acid Pancake"</p>
<p>9-11 PS2B - Atoms of the same element have the same number of protons. The number and arrangement of electrons determines how the atom interacts with other atoms to form molecules and ionic compounds.</p>	<p>SE/TE: 264-266 TE only: 264, 266</p> <p>Event-Based Science: <u>FRAUD!</u> 9, 10, 11-12, 17 <u>GOLD RUSH!</u> 1, 2-3, 4-6</p>
	<p>TR: Practice Book: "Subatomic Particles", Minds-On Activities Book: "Compare/Contrast: Scientific Models", "Exploring Atomic Landscapes"</p>

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9-11 PS2C - When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties. This Periodic Table is a consequence of the repeating pattern of outermost electrons.	SE/TE: 264-266 TE only: 267, 333 Event-Based Science: FRAUD! 9, 10 GOLDRUSH! 2-3, 4-6, 7
	TR: Practice Book: "Subatomic Particles"
9-11 PS2D - Ions are produced when atoms or molecules lose or gain electrons, thereby gaining a positive or negative electrical charge. Ions of opposite charge are attracted to each other, forming ionic bonds. Chemical formulas for ionic compounds represent the proportion of ion of each element in the ionic array.	SE/TE: 156, 330-333 TE only: 156, 331, 332
	TR: Laboratory Manual: "Molecules by Acme"
	TECH: Student CD: Ch17_IonicBonds.swf
9-11 PS2E - Compounds are composed of two or more elements bonded together in a fixed proportion by sharing electrons between atoms, forming covalent bonds. Such compounds consist of well-defined molecules. Formulas of covalent compounds represent the types and number of atoms of each element in each molecule.	SE/TE: 334-348 TE only: 334, 335, 338, 340, 341, 342, 343, 346, 348 Event-Based Science: FRAUD! 9, 12, 17 VOLCANO! 24-26, 28, 5 GOLD RUSH! 37 GLOBAL WARMING! 10-11 TOXIC LEAK! 42
	TR: Practice Book: "Atoms to Molecules to Molecular Attractions", "Types of Molecular Attractions", Minds-On Activities Book, "Venn Diagram: Chemical Bonds"
	TECH: Student CD: Ch17_CovalentBonds.swf
9-11 PS2F - All forms of life are composed of large molecules that contain carbon. Carbon atoms bond to one another and other elements by sharing, forming covalent bonds. Stable molecules of carbon have four covalent bonds per carbon atom.	SE/TE: 286-287, 338-342, 874 TE only: 338 Event-Based Science: FRAUD! 14 FIRE! 56-57, 62 GOLD RUSH! GLOBAL WARMING! 10-11, 12-13, 16 TOXIC LEAK! 41-42
	TR: Practice Book: "Shells and the Covalent Bond"

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9-11 PS2G - Chemical reactions change the arrangement of atoms in the molecules of substances. Chemical reactions release or acquire energy from their surroundings and result in the formation of new substances.	SE/TE: 311-315 TE only: 311, 315 Event-Based Science: <u>FRAUD!</u> 12, 21-22 <u>FIRE!</u> 8-9, 10-11, 24-25, 26, 40-41, 44-45, 50-51, 53, 58, 62 <u>GOLD MEDAL!</u> 13 <u>VOLCANO!</u> 51 <u>GOLD RUSH!</u> 2, 4-6 <u>GLOBAL WARMING!</u> 10-11
	TR: Practice Book: "Submicroscopic Thinking", "Physical and Chemical Change", Laboratory Manual: "Chemical Personalities"
9-11 PS2H - Solutions are mixtures in which particles of one substance are evenly distributed through another substance. Liquids are limited in the amount of dissolved solid or gas that they can contain. Aqueous solutions can be described by relative quantities of the dissolved substances and acidity or alkalinity (pH).	SE/TE: 307, 364-365, 413-416 TE only: 364, 413, 414, 415 Event-Based Science: <u>FRAUD!</u> 10-12, 16, 21-22, 23, 26 <u>FLOOD!</u> 21 <u>GOLD RUSH!</u> 2-3, 37-38 <u>GLOBAL WARMING!</u> 41-42, 61-62 <u>TOXIC LEAK!</u> 47 <u>BLIGHT!</u> 10-11
	TR: Practice Book: "Solution Terms and Supersaturation", "Find the Solution", Laboratory Manual", "Sugar Soft"
9-11 PS2I - The rate of a physical or chemical change may be affected by factors such as temperature, surface area, and pressure.	SE/TE: 313-315, 384-393 TE only: 384, 385, 387, 388, 389, 390, 391, 393 Event-Based Science: <u>FIRE!</u> 10-11, 26, 50-51, 54-55, 59 <u>TOXIC LEAK!</u> 30, 46
9-11 PS2J - The number of neutrons in the nucleus of an atom determines the isotope of the element. Radioactive isotopes are unstable and emit particles and/or radiation. Though the timing of a single nuclear decay is unpredictable, a large group of nuclei decay at a predictable rate, making it possible to estimate the age of materials that contain radioactive isotopes.	SE/TE: 268-270, 285-288, 811-813 TE only: 285, 286, 812, 813 Event-Based Science: <u>FRAUD!</u> 17
	TR: Practice Book: "Subatomic Practice", Minds-On Activities Book: "Model It: Half-Life", Laboratory manual: "Get a Half-Life"

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	TECH: Student CD: Ch15_RadioactiveDecay_VID.mov, Ch15_HalfLife_VID.mov
9-11 PS2K - Nuclear reactions convert matter into energy, releasing large amounts of energy compared with chemical reactions. Fission is the splitting of a large nucleus into smaller pieces. Fusion is the joining of nuclei and is the process that generates energy in the Sun and other stars.	SE/TE: 288-296 TE only: 288, 289 Event-Based Science: <u>FIRE!</u> 58
	TR: Practice Book: "Nuclear Fission and Fusion", Minds-On Activities Book: "Write About It: Fission and Fusion", Laboratory Manual: "Chain Reaction"
	TECH: Student CD: Ch15_ControllingNuclear_VID.mov, Ch15_NuclearFission_VID.mov
Performance Expectations	
Students are expected to:	
Describe the relative charges, masses, and locations of the protons, neutrons, and electrons in an atom of an element.	SE/TE: 275-276 Event-Based Science: <u>BLACKOUT!</u> 7
	TR: Practice Book: "Subatomic Particles", "Drawing Shells", "Atomic Size", Minds-On Activities Book: "Adopt and Element", Laboratory Manual: "Bright Lights"
Given the number and arrangement of electrons in the outermost shell of an atom, predict the chemical properties of the element.	SE/TE: 271-272, 275, 329-332, 355-356 TE only: 271, 272, 332 Event-Based Science: <u>FRAUD!</u> 9, 10 <u>GOLD RUSH!</u> 1, 2-3, 4-6
Given the number of protons, identify the element using a Periodic Table. Explain the arrangement of the elements on the Periodic Table, including the significant relationships among elements in a given column or row.	SE/TE: 264-266, 315-320 Event-Based Science: <u>FRAUD!</u> 9, 10 <u>GOLD RUSH!</u> 2-3, 4-6, 7
	TR: Practice Book: "Melting Points and Densities of the Elements", Minds-On Activities: "Exploring Atomic Landscape"

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Explain how ions and ionic bonds are formed (e.g., sodium atoms lose an electron and chlorine atoms gain an electron, then the charged ions are attracted to each other and form bonds). Explain the meaning of a chemical formula for an ionic array (e.g., NaCl).	SE/TE: 330-336, 353-356 TE only: 333
	TR: Practice Book: "Atoms to Molecules to Molecular Attractions", "Types of Molecular Attractions", Laboratory Manual: "Circular Rainbows"
	TECH: Student CD: Ch17_IonicBonds.swf
Give examples to illustrate that molecules are groups of two or more atoms bonded together (e.g., a molecule of water is formed when one oxygen atom shares electrons with two hydrogen atoms). Explain the meaning of a chemical formula for a molecule (e.g., CH ₄ or H ₂ O).	SE/TE: 328, 332, 336, 354 TE only: 334, 335 Event-Based Science: <u>FRAUD!</u> 9 <u>VOLCANO!</u> 24-26, 28, 51 <u>GLOBAL WARMING!</u> 10-11
	TR: Practice Book: "Balancing Chemical Equations", "Shells and the Covalent Bond"
Demonstrate how carbon atoms form four covalent bonds to make large molecules. Identify the functions of these molecules (e.g., plant and animal tissue, polymers, sources of food and nutrition, fossil fuels).	SE/TE: 286-287, 339-341, 448-470, 501-503, 849-850 Event-Based Science: <u>FRAUD!</u> 17 <u>FIRE!</u> 56-57, 62 <u>GOLD RUSH!</u> 5 <u>GLOBAL WARMING!</u> 10-11, 12-13, 16 <u>TOXIC LEAK!</u> 41-42
	TR: Practice Book: "Seven Carbon Questions", "Structures of Organic Compounds"
Describe at least three chemical reactions of particular importance to humans (e.g., burning of fossil fuels, photosynthesis, rusting of metals). Use a chemical equation to illustrate how the atoms in molecules are arranged before and after a reaction. Give examples of chemical reactions that either release or acquire energy and result in the formation of new substances (e.g., burning of fossil fuels releases large amounts of energy in the form of heat).	SE/TE: 313, 393-398, 403, 498-499, 848-850 TE only: 394, 396, 398 Event-Based Science: <u>FRAUD!</u> 11-12 <u>FIRE!</u> 8-9, 10-11, 24-25, 26, 40-41, 44-45, 50-51, 53, 58, 62 <u>GOLD MEDAL!</u> 13 <u>VOLCANO!</u> 51 <u>GOLD RUSH!</u> 2, 4-5 <u>GLOBAL WARMING!</u> 10-11

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	TR: Practice Book: "Exothermic and Endothermic Reactions", Laboratory Manual: "Bubble Round-Up"
Give examples of common solutions. Explain the differences among the processes of dissolving, melting, and reacting. Predict the result of adding increased amounts of a substance to an aqueous solution, in concentration and pH.	SE/TE: 364-365, 377-380 Event-Based Science: <u>FRAUD!</u> 11-12, 16, 21-22, 23, 26 <u>GOLD RUSH!</u> 37 <u>GLOBAL WARMING!</u> 41-42, 61-62 <u>TOXIC LEAK!</u> 47 <u>BLIGHT!</u> 10-11
	TR: Laboratory Manual: "Sugar Soft"
Predict the effect of a change in temperature, surface area, pressure, on the rate of a given physical or chemical change.	SE/TE: 313-315, 381, 384-393 TE only: 385, 386, 387, 389 Event-Based Science: <u>FIRE!</u> 10-11, 26, 50-51, 54-55, 59 <u>TOXIC LEAK!</u> 30, 46
Given the atomic number and atomic mass number of an isotope, students draw and label a model of the isotope's atomic structure (number of protons, neutrons and electrons). Given data from a sample, use a decay curve for a radioactive isotope to find the age of the sample. Explain how the decay curve is derived.	SE/TE: 268-276, 285-288, 812-813 TE only: 269, 285, 286, 389, 812 Event-Based Science: <u>FRAUD!</u> 17
	TR: Practice Book: "Drawing Shells", "Atomic Size", Laboratory Manual: "Get a Half-Life", Minds-On Activities: "Model It: Half-Life"
	TECH: Student CD: Ch15_RadioactiveDecay_VID.mov
Distinguish between nuclear fusion and nuclear fission by describing how each process transforms elements present before the reaction into elements present after the reaction.	SE/TE: 288-300 Event-Based Science: <u>FRAUD!</u> 17
	TR: Practice Book: "Nuclear Fission and Fusion", Minds-On Activities Book: "Write About It: Fission and Fusion", Laboratory Manual: "Chain Reaction"
	TECH: Student CD: Ch15_ControllingNuclear_VID.mov, Ch15_NuclearFission_VID.mov

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EALR 4: Physical Science	
Big Idea: Energy: Transfer, Transformation, and Conservation (PS3)	
Core Content: Transformation and Conservation of Energy	
<p>In prior grades, students learned to apply the concept of –energy in various settings. In grades 9-11, students learn fundamental concepts of energy, including the Law of Conservation of Energy—that the total amount of energy in a closed system is constant. Other key concepts include gravitational potential and kinetic energy, how waves transfer energy, the nature of sound and the electromagnetic spectrum. Energy concepts are essential for understanding all of the domains of science, from the ways that organisms get energy from their environment, to the energy that drives weather systems and volcanoes.</p>	
Content Standards	
Students know that:	
<p>9-11 PS3A - Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system is constant and can neither be created nor destroyed. (Conservation of Energy)</p>	<p>SE/TE: 99-101 TE only: 99, 100</p> <p>Event-Based Science: <u>THRILL RIDE!</u> 11-12, 17, 21-22, 24, 35-37 <u>FIRE!</u> 10-11, 50-51, 53, 54-55, 58, 62 <u>BLACKOUT!</u> 9, 10-11, 12, 14-15, 21, 34-35 <u>GLOBAL WARMING!</u> 20</p>
	<p>TR: Practice Book: "Work and Energy", "Conservation of Energy", "Momentum Challenge", Minds-On Activities Book: "The Way the Ball Bounces", "Energy Experience", Laboratory Manual: "Conservation of Energy"</p>
	<p>TECH: Student CD: Ch6_ConservationOfEne_VID.mov</p>
<p>9-11 PS3B - Kinetic energy is the energy of motion. The kinetic energy of an object is defined by the equation: $E_k = \frac{1}{2} mv^2$</p>	<p>SE/TE: 97-99, 101 TE only: 97</p> <p>Event-Based Science: <u>THRILL RIDE!</u> 11-12, 17, 21-22, 24, 35, 36-37</p>
	<p>TECH: Student CD: Ch6_BowlingBallConser_VID.mov</p>

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9-11 PS3C - Gravitational potential energy is due to the separation of mutually attracting masses. Transformations can occur between gravitational potential energy and kinetic energy, but the total amount of energy remains constant.	SE/TE: 95-96 TE only: 95 Event-Based Science: <u>THRILL RIDE!</u> 11-12, 17, 21-22, 24, 35, 43
	TR: Practice Book: "Work and Energy"
9-11 PS3D - Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, amplitudes, and travel at different speeds.	SE/TE: 148, 195-196, 198-200, 216, 248-251, 768-769, 831-833 TE only: 195, 196, 197 Event-Based Science: <u>EARTHQUAKE!</u> 21 <u>OIL SPILL!</u> 20-21
	TR: Practice Book: "Vibration and Wave Fundamentals", "Sound", Minds-On Activities Book: "Waves and Sound", "Sound Surfing", "Write About it Sound", Laboratory Manual: "Slow-Motion Wobbler"
	TECH: Student CD: Ch11_LongitudinalVsTra_VID.mov
9-11 PS3E - Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.	SE/TE: 147, 216-217, 219, 236-251 TE only: 147 Event-Based Science: <u>BLACKOUT!</u> 21 <u>GLOBAL WARMING!</u> 9 <u>SURVIVE!</u> 24, 29
	TR: Practice Book: "Light", Minds-On Activities Book: "Meet the Electromagnetic Spectrum", "Color Crazy"
	TECH: Student CD: Ch12_YellowgreenPeakOf_VID.mov

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Performance Expectations	
Students are expected to:	
Describe a situation in which energy is transferred from one place to another, and explain how energy is conserved. Describe a situation in which energy is transformed from one form to another and explain how energy is conserved.	SE/TE: 99-103, 656 TE only: 99, 100, 101, 656 Event-Based Science: <u>THRILL RIDE!</u> 11-12, 17, 21-22, 24, 35 <u>FIRE!</u> 10-11, 50-51, 53, 54-55, 58, 62 <u>BLACKOUT!</u> 9, 10-11, 12, 14-15, 21, 34-35 <u>GLOBAL WARMING!</u> 20
	TR: Practice Book: "Work and Energy", "Conservation of Energy", "Momentum Challenge", Minds-On Activities Book: "The Way the Ball Bounces", "Energy Experience", Laboratory Manual: "Conservation of Energy"
	TECH: Student CD: Ch6_ConservationOfEne_VID.mov
Calculate the kinetic energy of an object, given the object's mass and velocity.	SE/TE: 97 TE only: 97 Event-Based Science: <u>THRILL RIDE!</u> 11-12, 21-22, 35
Give an example in which gravitational potential energy and kinetic energy are changed from one to the other (e.g., a child on a swing illustrates the alternating transformation of kinetic and gravitational potential energy).	SE/TE: 94-96, 100, 108-112 TE only: 95, 96 Event-Based Science: <u>THRILL RIDE!</u> 11-12, 17, 21-22, 24, 35
	TR: Minds-On Activities Book: "Rubber Band Power", Practice Book: "Conservation of Energy"
	TECH: Student CD: Ch6_BowlingBallConser_VID.mov
Demonstrate how energy can be transmitted by sending waves along a spring or rope. Characterize physical waves by frequency, wavelength, amplitude, and speed. Apply these properties to the pitch and volume of sound waves, and to the wavelength and magnitude of water waves.	SE/TE: 198-200 TE only: 198, 199 Event-Based Science: <u>EARTHQUAKE!</u> 21 <u>OIL SPILL!</u> 20-21

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	TR: Practice Book: "Vibration and Wave Fundamentals", "Sounds"
	TECH: Student CD: Ch11_LongitudinalVsTra_VID.mov
Illustrate the electromagnetic spectrum with a labeled diagram, showing how regions of the spectrum differ regarding wavelength, frequency, and energy, and how they are used (e.g., infrared in heat lamps, microwaves for heating foods, X-rays for medical imaging).	SE/TE: Can Be Developed From: 217, 781 TE only: Can Be Developed From: 217 Event-Based Science: <u>BLACKOUT!</u> 21 <u>GLOBAL WARMING!</u> 9 <u>SURVIVE!</u> 24, 29
	TR: Minds-On Activities Book: "Meet the Electromagnetic Spectrum", "Color Crazy"
EALR 4: Earth and Space Science	
Big Idea: Energy: Transfer, Transformation, and Conservation (PS3)	
Core Content: Evolution of the Universe	
In prior grades, students learned about other objects in the Solar System, and how they are held together by a force called —gravity.□ In grades 9-11, students learn the current scientific theory about the origin of the universe and subsequent formation of our Solar System. These discoveries are based on the important concept that the physical principles that apply today on Earth apply everywhere in the universe, now and in the distant past. These fundamental concepts help students make coherent sense of the universe and engage in further wondering and learning.	
Content Standards	
Students know that:	
9-11 ES1A - Stars have life cycles. During their active periods, stars produce heavier elements, starting with the fusion of hydrogen to form helium. The heaviest elements are formed when massive stars —die in massive explosions.	SE/TE: 886-889, 897-899 Event-Based Science: <u>ASTEROID!</u> 21, 22 <u>GLOBAL WARMING?</u> 1
	TR: Practice Book: "Stellar Parallax"
	TECH: Student CD: Ch39_LivesOfStars_1.mov, Ch39_LivesOfStars_2.mov, Ch39_LivesOfStars_3.mov, Ch39_LivesOfStars_4.mov, Ch39_LivesOfStars_5.mov, Ch39_LivesOfStars_6.mov

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<p>9-11 ES1B - The Big Bang theory of the origin of the universe is based on evidence (e.g., red shift) that all galaxies are rushing apart from one another. As space expanded, and matter began to cool, gravitational attraction pulled clumps of matter together, forming the stars and galaxies, clouds of gas and dust, and planetary systems that we see today. If we were to run time backwards we would find that all of the galaxies were in the same place 14.7 billion years ago.</p>	<p>SE/TE: 895-896 TE only: 895</p> <p>Event-Based Science: <u>ASTEROID!</u>: 22, 31</p>
	<p>TECH: Student CD: Ch39_BigBang_1.mov, Ch39_BigBang_2.mov, Ch39_BigBang_3.mov, Ch39_BigBang_4.mov, Ch39_BigBang_5.mov</p>
Performance Expectations	
Students are expected to:	
<p>Connect the life cycles of stars to the production of elements through the process of nuclear fusion.</p>	<p>SE/TE: 295, 886-887, 895-896 TE only: 887, 896</p> <p>Event-Based Science: <u>ASTEROID!</u> 21, 22 <u>GLOBAL WARMING?</u> 1</p>
	<p>TECH: Student CD: Ch39_LivesOfStars_1.mov</p>
<p>Cite evidence that supports the Big Bang theory (e.g., red shift of galaxies).</p>	<p>SE/TE: 895-896</p> <p>Event-Based Science: <u>ASTEROID!</u>: 22, 31</p>
	<p>TR: Practice Book, "Stellar Parallax"</p>

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EALR 4: Earth and Space Science	
Big Idea: Earth Systems, Structures, and Processes (ES2)	
Core Content: Energy in Earth Systems	
<p>In prior grades, students learned about planet Earth as an interacting system of solids, liquids, and gases, and about the water cycle, the rock cycle, and the movement of crustal plates. In grades 9-11, students learn how the uneven heating of Earth’s surface causes differences in climate in different parts of the world, and how the tilt of Earth’s axis with respect to the plane of its orbit around the Sun causes seasonal variations. Students also learn about the essential biogeochemical cycles that continuously move elements such as carbon and nitrogen through Earth systems. These major ideas about energy inputs and outputs in and around the Earth help students understand Earth as a dynamic system.</p>	
Content Standards	
Students know that:	
<p>9-11 ES2A - Global climate differences result from the uneven heating of Earth’s surface by the Sun. Seasonal climate variations are due to the tilt of Earth’s axis with respect to the plane of Earth’s nearly circular orbit around the Sun.</p>	<p>SE/TE: 142-143, 776, 784-787, 843, 845-847 TE only: 142, 143, 776, 785, 786, 843, 846</p> <p>Event-Based Science: <u>ASTERIROID!</u> 33, 42-43 <u>GLOBAL WARMING?</u> 24, 46-47</p>
	<p>TR: Laboratory Manual: “Temperature Mix”, “Spiked Water”</p>
<p>9-11 ES2B - Climate is determined by energy transfer from the sun at and near Earth’s surface. This energy transfer is influenced by dynamic processes such as cloud cover and Earth’s rotation, as well as static conditions such as proximity to mountain ranges and the ocean. Human activities, such as burning of fossil fuels, also affect the global climate.</p>	<p>SE/TE: 719-720, 788-800, 842-850 TE only: 720, 844, 848</p> <p>Event-Based Science: <u>ASTERIROID!</u> 1-2, 33 <u>GLOBAL WARMING?</u> 8, 9, 10-11, 20, 24, 43, 44 <u>HURRICANE!</u> 17 <u>VOLCANO!</u> 51 <u>TORNADO!</u> 3-4</p>
	<p>TR: Practice Book: “Atmospheric Carbon Dioxide and Global Temperature: A Match?”</p>
<p>9-11 ES2C - Earth is a system that contains a fixed amount of each stable chemical element, existing in different chemical forms. Each element on Earth moves among reservoirs in the solid Earth, oceans, atmosphere, and organisms as part of biogeochemical cycles, driven by energy from Earth’s interior and from the Sun.</p>	<p>SE/TE: 660-663 TE only: 660, 661, 662</p> <p>Event-Based Science: <u>GLOBAL WARMING?</u> 10-11, 12-13, 16, 20, 22</p>

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9-11 ES2D - The earth does not have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources and it depletes those resources that cannot be renewed.	SE/TE: 104-106, 666-667, 719-720 Event-Based Science: <u>TOXIC LEAK!</u> 41-42 <u>GOLD RUSH!</u> 45
Performance Expectations	
Students are expected to:	
Explain that Earth is warmer near the equator and cooler near the poles due to the uneven heating of Earth by the Sun. Explain that it's warmer in summer and colder in winter for people in Washington State because the intensity of sunlight is greater and the days are longer in summer than in winter. Connect these seasonal changes in sunlight to the tilt of Earth's axis with respect to the plane of its orbit around the Sun.	SE/TE: 843-847, 852-853 TE only: 843 Event-Based Science: <u>ASTERIROID!</u> 33, 42-43 <u>GLOBAL WARMING?</u> 24, 46-47
Explain how the climate in the Pacific Northwest region is affected by seasonal weather patterns, as well as other factors such as the addition of greenhouse gases to the atmosphere, and proximity to mountain ranges and to the ocean.	SE/TE: 142-143, 782-784, 789-793, 845-847, 851 TE only: 142, 782, 783 Event-Based Science: <u>ASTERIROID!</u> 1-2, 33 <u>GLOBAL WARMING?</u> 8, 9, 10-11, 20, 24, 43, 44 <u>HURRICANE!</u> 17 <u>VOLCANO!</u> 51 <u>TORNADO!</u> 3-4
TR: Practice Book: "Weather Maps"	
Describe the different forms taken by carbon and nitrogen, and the reservoirs where they are found. Give examples of carbon found on Earth (e.g., carbonate rocks such as limestone, in coal and oil, in the atmosphere as carbon dioxide gas, and in the tissues of all living organisms).	SE/TE: 442-470, 662-663 TE only: 442, 444, 445, 446, 447, 448, 449, 450, 453, 456, 458, 459, 460, 461, 462 Event-Based Science: <u>GLOBAL WARMING?</u> 10-11, 12-13, 16, 20, 22
TR: Practice Book: "Structures of Organic Compounds", "Polymers", Minds-On Activities: "Useful Hydrocarbons from Petroleum", "The Chemistry of Functional Groups", Map It: "Organic Chemistry", Laboratory Manual: "Smells Great", "Name That Recyclable"	

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Identify renewable and nonrenewable resources in the Pacific Northwest region. Explain how human use of natural resources stress natural processes and link that use to a possible long term consequence.	SE/TE: 105, 647, 661, 664, 665, 666-668 TE only: 661, 664, 665, 666, 824 Event-Based Science: <u>TOXIC LEAK!</u> 41-42 <u>GOLD RUSH!</u> 45
EALR 4: Earth and Space Science	
Big Idea: Earth History (ES3)	
Core Content: Evolution of the Earth	
<p>In prior grades, students learned about a few of the methods that have made it possible to uncover the history of our planet. In grades 9-11, students learn about the major changes in Earth systems over geologic time and some of the methods used to gather evidence of those changes. Methods include observation and measurement of sediment layers, using cores drilled from the sea bottom and from ancient glaciers, and the use of radioactive isotopes. Findings of Earth history include the existence of life as early as nearly 4 billion years ago and major changes in the composition of Earth's atmosphere.</p>	
Content Standards	
Students know that:	
9-11 ES3A - Interactions among the solid Earth, the oceans, the atmosphere, and organisms have resulted in the ongoing evolution of the Earth system. We can observe changes such as earthquakes and volcanic eruptions on a human scale, but many processes such as mountain building and plate movements take place over hundreds of millions of years.	SE/TE: 675-698, 728-739, 813-814 TE only: 675, 677, 678, 682, 683, 687, 688, 690, 693, 813 Event-Based Science: <u>GLOBAL WARMING?</u> 1, 10-11, 12-13, 22, 31, 34-36 <u>TOXIC LEAK!</u> 29 <u>GOLD RUSH!</u> 22-23 <u>VOLCANO!</u> 3-4, 19-20, 38, 49-50 <u>FLOOD!</u> 16, 17-19, 32, 42 <u>EARTHQUAKE!</u> 16, 17, 21-23
TR: Practice Book: "Geologic Time Match-Up"	
9-11 ES3B - Geologic time can be estimated by several methods (e.g., counting tree rings, observing rock sequences, using fossils to correlate sequences at various locations, and using the known decay rates of radioactive isotopes present in rocks to measure the time since the rock was formed).	SE/TE: 544, 806-813 TE only: 544, 806, 807, 808, 809, 812, 813
TR: Practice Book: "Relative Dating Principles", "A Geologic History"	

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9-11 ES3C - Evidence for one-celled forms of life—the bacteria—extends back billions of years. The appearance of life on Earth caused dramatic changes in the composition of Earth's atmosphere, which did not originally contain oxygen.	SE/TE: 542-544, 807, 815-816 TE only: 542, 543, 808, 815 Event-Based Science: <u>SURVIVE!</u> : 25, 49 <u>GLOBAL WARMING?</u> 1
9-11 ES3D - Data gathered from a variety of methods have shown that Earth has gone through a number of periods when Earth was much warmer and much colder than today.	SE/TE: 815-825, 844-847 TE only: 824, 844, 846 Event-Based Science: <u>GLOBAL WARMING?</u> 12-13, 23, 25-26, 49
	TR: Practice Book: "Geologic Time Match-Up", "Atmospheric Carbon Dioxide and Global Temperature: A Match?"
Performance Expectations	
Students are expected to:	
Interpret current rock formations of the Pacific Northwest as evidence of past geologic events. Consider which Earth processes may have caused these landforms (e.g., erosion, deposition, and scraping of terrain by glaciers, floods, volcanic eruptions, tsunami), and construct a timeline showing the development of the landform.	SE/TE: 808-810, 826-829 TE only: 807, 808, 809 Event-Based Science: <u>GLOBAL WARMING?</u> 1, 10-11, 12-13, 22, 31, 34-36 <u>GOLD RUSH!</u> 22-23 <u>VOLCANO!</u> 3-4, 19-20, 38, 49-50 <u>FLOOD!</u> 16, 17-19, 32, 42 <u>EARTHQUAKE!</u> 16, 17, 21-23
	TR: Practice Book: "Relative Dating Principles", "A Geologic History"
Explain how decay rates of radioactive materials in rock layers are used to establish the timing of geologic events. Given a geologic event, explain multiple methods that could be used to establish the timing of that event.	SE/TE: 811-813, 826-829 TE only: 812, 813
Compare the chemical composition of the Earth's atmosphere before bacteria and plants evolved and after they became widespread.	SE/TE: 808, 814829 TE only: 815, 817 Event-Based Science: <u>GLOBAL WARMING?</u> 1
	TECH: Student CD: Ch38_HistoryOfSS_4.mov

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Describe factors that change climates over long periods of time and cite methods that scientists have found to gather information on ancient climates.	SE/TE: 844-853 TE only: 844, 846, 848 Event-Based Science: <u>GLOBAL WARMING?</u> 12-13, 23, 25-26, 49
	TR: Practice Book: "Atmospheric Carbon Dioxide and Global Temperature: A Match?"
EALR 4: Life Science	
Big Idea: Structures and Functions of Living Organisms (LS1)	
Core Content: Processes Within Cells	
<p>In prior grades, students learned that all living systems are composed of cells, which make up tissues, organs, and organ systems. In grades 9-11, students learn that cells have complex molecules and structures that enable them to carry out life functions such as photosynthesis and respiration and pass on their characteristics to future generations. Information for producing proteins and reproduction is coded in DNA and organized into genes in chromosomes. This elegant yet complex set of processes explains how life forms replicate themselves with slight changes that make adaptations to changing conditions possible over long periods of time. These processes that occur within living cells help students understand the commonalities among the diverse living forms that populate Earth today.</p>	
Content Standards	
Students know that:	
9-11 LS1A - Carbon-containing compounds are the building blocks of life. Photosynthesis is the process that plant cells use to combine the energy of sunlight with molecules of carbon dioxide and water to produce energy-rich compounds that contain carbon (food) and release oxygen.	SE/TE: 107, 109, 501-503, 874 TE only: 501, 502, 503 Event-Based Science: <u>BLIGHT!</u> : 10-11
	TR: Practice Book: "Photosynthesis"
9-11 LS1B - The gradual combustion of carbon-containing compounds within cells, called cellular respiration, provides the primary energy source of living organisms; and the combustion of carbon by burning of fossil fuels provides the primary energy source for most of modern society.	SE/TE: 501-503, 849 TE only: 501, 502, 503 Event-Based Science: <u>BLIGHT!</u> : 10-11
	TR: Practice Book: "Cellular Respiration", Laboratory Manual: "Liver and Potatoes"

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9-11 LS1C - Cells contain specialized parts for determining its essential functions, such as regulation of cellular activities, energy capture and release, formation of proteins, waste disposal, the transfer of information, and movement.	SE/TE: 478-495, 502-504 TE only: 478, 479, 480, 483, 484, 485 Event-Based Science: <u>BLIGHT!</u> : 10-11
	TR: Practice Book: "Prokaryotic Cells and Eukaryotic Cells", "Eukaryotic Organelles", Laboratory Manual: "Eye Into the Tiny"
9-11 LS1D - The cell is surrounded by a membrane that separates the interior of the cell from the outside world and determines which substances may enter and which may leave the cell.	SE/TE: 479, 486-487 TE only: 479, 486, 487
	TR: Practice Book: "The Cell Membrane", Laboratory Manual: "Are You In or Out?", "To Catch a Pond Critter"
9-11 LS1E - The genetic information responsible for inherited characteristics is encoded in the DNA molecules in chromosomes. DNA is composed of four subunits (A,T,C,G). The sequence of subunits in a gene specifies the amino acids needed to make a protein. Proteins express inherited traits (e.g., eye color, hair texture) and carry out most cell function.	SE/TE: 463-477, 510-519 TE only: 463, 464, 465, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519
	TR: Practice Book: "DNA Replication", "Transcription and Translation", "Chromosomes", "Dominant and Recessive Traits", Laboratory Manual: "Whodunit?", "Don't Sell That DNA on eBay"
9-11 LS1F - All of the functions of the cell are based on chemical reactions. Food molecules are broken down to provide the energy and the chemical constituents needed to synthesize other molecules. Breakdown and synthesis are made possible by proteins called enzymes. Some of these enzymes enable the cell to store energy in special chemicals, such as ATP, that are needed to drive the many other chemical reactions in a cell.	SE/TE: 492-500 TE only: 492, 493, 494, 495, 496, 497, 498, 499, 500
	TR: Practice Book: "Diffusion and Osmosis", "Facilitated Diffusion and Active Transport", "Cellular Respiration", Laboratory Manual: "Return of the Dead", "Liver and Potatoes"

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9-11 LS1G - Cells use the DNA that forms their genes to encode enzymes and other proteins that allow a cell to grow and divide to produce more cells, and respond to the environment.	SE/TE: 508-520 TE only: 508, 509, 511, 512, 515, 516, 519, 520
	TR: Practice Book: "DNA Replication", "Transcription and Translation"
9-11 LS1H - Genes are carried on chromosomes. Animal cells contain two copies of each chromosome with genetic information that regulate body structure and functions. Cells divide by a process called mitosis, in which the genetic information is copied so that each new cell contains exact copies of the original chromosomes.	SE/TE: 496-497,509-510, 519 TE only: 496, 497, 509, 510, 519
	TR: Practice Book: "Comparing Mitosis and Meiosis"
9-11 LS1I - Egg and sperm cells are formed by a process called meiosis in which each resulting cell contains only one representative chromosome from each pair found in the original cell. Recombination of genetic information during meiosis scrambles the genetic information, allowing for new genetic combinations and characteristics in the offspring. Fertilization restores the original number of chromosome pairs and reshuffles the genetic information, allowing for variation among offspring.	SE/TE: 516-520 TE only: 516, 517, 518, 519, 520
	TR: Practice Book: "Chromosomes", "Comparing Mitosis and Meiosis"
Performance Expectations	
Students are expected to:	
Explain how plant cells use photosynthesis to produce their own food. Use the following equation to illustrate how plants rearrange atoms during photosynthesis: $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$. Explain the importance of photosynthesis for both plants and animals, including humans.	SE/TE: 107, 109, 501-503, 874 TE only: 502 Event-Based Science: <u>BLIGHT!</u> : 10-11
	TR: Practice Book: "Photosynthesis"

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Explain how the process of cellular respiration is similar to the burning of fossil fuels (i.e., both processes involve combustion of carbon-containing compounds to transform chemical energy to a different form of energy).	SE/TE: Can Be Developed From: 502-503, 849 TE only: Can Be Developed From: 502-503
	TR: Practice Book: "Cellular Respiration"
Draw, label, and describe the functions of components of essential structures within cells (i.e., cellular membrane, nucleus, chromosome, chloroplast, mitochondrion, ribosome)	SE/TE: 479, 483-487, 489, 493-495 TE only: 479, 484
	TR: Can Be Developed From: Practice Book, "Eukaryotic Organelles"
Describe the structure of the cell membrane and how the membrane regulates the flow of materials into and out of the cell.	SE/TE: 486-489, 492-495, 502-504 TE only: 486, 487, 492, 493, 494, 495, 502, 503
	TR: Practice Book: "The Cell Membrane", "Diffusion and Osmosis", "Facilitated Diffusion and Active Transport", Laboratory Manual: "Are You In or Out?", "To Catch a Pond Critter"
Describe how DNA molecules are long chains linking four subunits (smaller molecules) whose sequence encodes genetic information. Illustrate the process by which gene sequences are copied to produce proteins.	SE/TE: 477, 510-516, 521-522 TE only: 511, 512, 514, 515, 516
	TR: Practice Book: "DNA Replication", Laboratory Manual: "Whodunit?", "Don't Sell That DNA on eBay"
Explain how cells break down food molecules and use the constituents to synthesize proteins, sugars, fats, DNA and many other molecules that cells require. Describe the role that enzymes play in the breakdown of food molecules and synthesis of the many different molecules needed for cell structure and function. Explain how cells extract and store energy from food molecules.	SE/TE: 484-490, 491-495, 498-504, 505-507 TE only: 485, 486, 491, 492, 493, 497, 499, 502
	TR: Practice Book: "Eukaryotic Organelles", Laboratory Manual: "Liver and Potatoes"

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Explain that regulation of cell functions can occur by changing the activity of proteins within cells and/or by changing whether and how much particular genes are expressed.	SE/TE: 493-494, 505-507, 509-510, 521-522 TE only: 510, 511
Describe and model the process of mitosis, in which one cell divides, producing two cells, each with copies of both chromosomes from each pair in the original cell.	SE/TE: 496-497, 519 TE only: 496, 497, 519
	TR: Practice Book, "Chromosomes"
Describe and model the processes of meiosis, in which egg and sperm cells are formed with only one set of chromosomes from each parent. Model and explain the process of genetic recombination that may occur during meiosis and how this then results in differing characteristics in offspring. Describe the process of fertilization that restores the original chromosome number, while reshuffling the genetic information, allowing for variation among offspring. Predict the outcome of specific genetic crosses involving two characteristics	SE/TE: 516-519, 521-522, 523-529, 538-540 TE only: 524, 529
	TR: Practice Book: "Comparing Mitosis and Meiosis", "Dominant and Recessive Traits", "Inheritance Patterns", Laboratory Manual: "Baby Face", "The Fly"

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EALR 4: Life Science	
Big Idea: Ecosystems (LS2)	
Core Content: Maintenance and Stability of Populations	
<p>In prior grades, students learned to apply key concepts about ecosystems to understand the interactions among organisms and the nonliving environment. In grades 9-11, students learn about the factors that foster or limit growth of populations within ecosystems and that help to maintain the health of the ecosystem overall. Organisms participate in the cycles of matter and flow of energy to survive and reproduce. Given abundant resources, populations can increase at rapid rates. But living and nonliving factors limit growth, resulting in ecosystems that can remain stable for long periods of time. Understanding the factors that affect populations is important for many societal issues, from decisions about protecting endangered species to questions about how to meet the resource needs of civilization while maintaining the health and sustainability of Earth's ecosystems.</p>	
Content Standards	
Students know that:	
<p>9-11 LS2A - Matter and energy is transferred and cycled through living and nonliving components in ecosystems. The cycling of matter and energy is important for maintaining the health and sustainability of an ecosystem.</p>	<p>SE/TE: 654-656, 660-663 TE only: 654, 655, 656, 660, 661, 662</p>
<p>9-11 LS2B - Living organisms have the capacity to produce very large populations. Population density is the number of individuals of a particular population living in a given amount of space.</p>	<p>SE/TE: 666-668 TE only: 666, 667, 668</p>
<p>9-11 LS2C - Population growth is limited by the availability of matter and energy found in resources, the size of the environment, and the presence of competing and/or predatory organisms.</p>	<p>SE/TE: 666-668 TE only: 666, 667, 668</p> <p>Event-Based Science: <u>BLIGHT!</u>: 15, 38-41</p>
<p>9-11 LS2D - Scientists represent systems in the natural world, using mathematical models.</p>	<p>SE/TE: 23, 29, 39, 45, 101, 115, 118, 416, 666-668, 864, 886 TE only: 666</p> <p>Event-Based Science: Representative Selections: <u>ASTEROID!</u>: 51-52 <u>GOLD RUSH!</u>: 53-54 <u>THRILL RIDE!</u>: 49 <u>GLOBAL WARMING!</u>: 27</p>

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9-11 LS2E - Interrelationships of organisms may generate ecosystems that are stable for hundreds or thousands of years. Biodiversity refers to the different kinds of organisms in specific ecosystems or on the planet as a whole.	SE/TE: 649-653 TE only: 649, 650, 651, 652, 653 Event-Based Science: <u>SURVIVE!</u> : 54
9-11 LS2F - The concept of sustainable development supports adoption of policies that enable people to obtain the resources they need today, without limiting the ability of future generations to meet their own needs. Sustainable processes include substituting renewable for nonrenewable resources, recycling, and using fewer resources.	SE/TE: 104-107, 666-667 TE only: 106, 666
	TR: Minds-On Activities: "How Efficient is your Bicycle?"
Performance Expectations	
Students are expected to:	
Explain how plants and animals cycle carbon and nitrogen within an ecosystem. Explain how both matter and energy cycle in ecosystems, resulting in the formation of differing chemical compounds and heat.	SE/TE: 654-656, 660-663, 670 TE only: 654, 655, 656, 660, 661, 662 Event-Based Science: <u>GLOBAL WARMING!</u> : 12-13
Evaluate the conditions necessary for rapid population growth (e.g., given adequate living and nonliving resources and no disease or predators, populations of an organism increase at rapid rates). Given ecosystem data, calculate the population density of an organism.	SE/TE: 666, 669-672 TE only: 667, 668
Explain factors, to include matter and energy, in the environment that limit the growth of plant and animal populations in natural ecosystems.	SE/TE: 666-667, 669-672 TE only: 666, 668
Draw a systems diagram to illustrate and explain why introduced (nonnative) species often do poorly and have a tendency to die out, as well as why they sometimes do very well and force out native species.	SE/TE: Can Be Developed From: 647, 650, 653, 669-671 TE only: Can Be Developed From: 652, 653 Event-Based Science: Can Be Developed From: <u>BLIGHT!</u> : 36

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Compare the biodiversity of organisms in different types of ecosystems (e.g., rain forest, grassland, desert) noting the interdependencies and interrelationships among the organisms in these different ecosystems.	SE/TE: 656-660, 669-671 TE only: 657, 658, 659
	TR: Practice Book: "Biomes and Aquatic Habitats"
Explain how scientific concepts and findings relate to a resource issue currently under discussion in the state of Washington (e.g., removal of dams to facilitate salmon spawning in rivers; construction of wind farms). Explain how the concept of sustainable development may be applied to a current resource issue in the state of Washington.	SE/TE: 663-665, 667 TE only: 663, 665 Event-Based Science: Can Be Developed From: <u>BLACKOUT!</u> : 35
EALR 4: Life Science	
Big Idea: Biological Evolution (LS3)	
Core Content: Mechanisms of Evolution	
In prior grades, students learned how the traits of organisms are passed on through the transfer of genetic information during reproduction. In grades 9-11, students learn about the factors that underlie biological evolution: variability of offspring, population growth, a finite supply of resources, and natural selection. Both the fossil record and analyses of DNA have made it possible to better understand the causes of variability and to determine how the many species alive today are related. Evolution is the major framework that explains the amazing diversity of life on our planet and guides the work of the life sciences.	
Content Standards	
Students know that:	
9-11 LS3A - Biological evolution is due to: (1) genetic variability of offspring due to mutations and genetic recombination, (2) the potential for a species to increase its numbers, (3) a finite supply of resources, and (4) selection by the environment for those offspring better able to survive and produce offspring.	SE/TE: 523-537, 541, 544-565, 571-573 TE only: 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 541, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 570, 571, 572, 573 Event-Based Science: <u>SURVIVE!</u> : 1-2, 28-31, 35-43

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	TR: Practice Book: "Dominant and Recessive Traits", "Inheritance Patterns", "Natural Selection", "Variable Traits, Heritable Traits"; Laboratory Manual: "Baby Face", "The Fly", "The Birds and the Bugs"
9-11 LS3B - Random changes in the genetic makeup of cells and organisms (mutations) can cause changes in their physical characteristics or behaviors. If the genetic mutations occur in eggs or sperm cells, the changes will be inherited by offspring. While many of these changes will be harmful, a small minority may allow the offspring to better survive and reproduce.	SE/TE: 516-519, 523, 537, 544-565 TE only: 518, 519, 523, 526, 527 Event-Based Science: <u>SURVIVE!</u> : 14, 28-31
	TR: Practice Book: "Variable Traits, Heritable Traits", "Natural Selection", "Size and Shape", Laboratory Manual: "Baby Face", "The Fly", "The Birds and the Bugs"
9-11 LS3C - The great diversity of organisms is the result of more than 3.5 billion years of evolution that has filled available ecosystem niches on Earth with life forms.	SE/TE: 542-543, 564 TE only: 542, 543 Event-Based Science: <u>SURVIVE!</u> : 3, 25, 46-47
9-11 LS3D - The fossil record and anatomical and molecular similarities observed among diverse species of living organisms provide evidence of biological evolution.	SE/TE: 542, 560-565 TE only: 560, 561, 562, 563, 564, 565 Event-Based Science: <u>SURVIVE!</u> : 9
9-11 LS3E - Biological classifications are based on how organisms are related, reflecting their evolutionary history. Scientists infer relationships from physiological traits, genetic information, and the ability of two organisms to produce fertile offspring.	SE/TE: 560-565, 572 TE only: 561, 564, 565 Event-Based Science: <u>SURVIVE!</u> : 7
	TR: Practice Book: "Classification", "Evolutionary Trees"

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Performance Expectations	
Students are expected to:	
Explain biological evolution as the consequence of the interactions of four factors: population growth, inherited variability of offspring, a finite supply of resources, and natural selection by the environment of offspring better able to survive and reproduce. Predict the Effect on a species if one of these factors should change.	SE/TE: 565, 567 Event-Based Science: <u>SURVIVE!</u> : 46-47
Describe the molecular process by which organisms pass on physical and behavioral traits to offspring, as well as the environmental and genetic factors that cause minor differences (variations) in offspring or occasional —mistakes in the copying of genetic material that can be inherited by future generations (mutations.) Explain how a genetic mutation may or may not allow a species to survive and reproduce in a given environment.	SE/TE: 516-519, 523-540, 541-559 TE only: 525, 526, 527, 530, 531, 533, 534, 535, 536, 537, 542, 545, 546, 547, 548, 549, 550, 552, 553, 554, 555, 556, 557, 558, 559 Event-Based Science: <u>SURVIVE!</u> : 30-31
	TR: Practice Book: "Variable Traits, Heritable Traits"; Laboratory Manual: "The Birds and the Bugs"
Explain how the millions of different species alive today are related by descent from a common ancestor. Explain that genes in organisms that are very different (e.g., yeast, flies, and mammals) can be very similar because these organisms all share a common ancestor.	SE/TE: 542-565, 570-575, 582 TE only: 557, 559 Event-Based Science: <u>SURVIVE!</u> : 41
Using the fossil record and anatomical and/or molecular (DNA) similarities as evidence, formulate a logical argument for biological evolution as an explanation for the development of a representative species (e.g., birds, horses, elephants, whales).	SE/TE: 541, 558-565, 566-569 Event-Based Science: <u>SURVIVE!</u> : 9, 15, 17, 19, 25, 38
Classify organisms, using similarities and differences in physical and functional characteristics. Explain similarities and differences among closely related organisms in terms of biological evolution (e.g., —Darwin’s finches had different beaks due to food sources on the islands where they evolved).	SE/TE: 548, 551-557, 560-565, 570-583, 585-594 TE only: 548, 551, 553, 556, 560, 561, 562, 563, 564, 565, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 585, 586, 587, 588, 589, 591 Event-Based Science: <u>SURVIVE!</u> : 7, 35