Colorado Teacher-Authored Instructional Unit Sample

Science
7th Grade

Unit Title: Shake, Rattle, and Roll

INSTRUCTIONAL UNIT AUTHORS

Ellicott School District
- Anja Centennial
- Diana Ford
- Nicholas Kaloudis
- Michael Webb
- Corey Zukie

Hanover School District
- Kimberly Barre

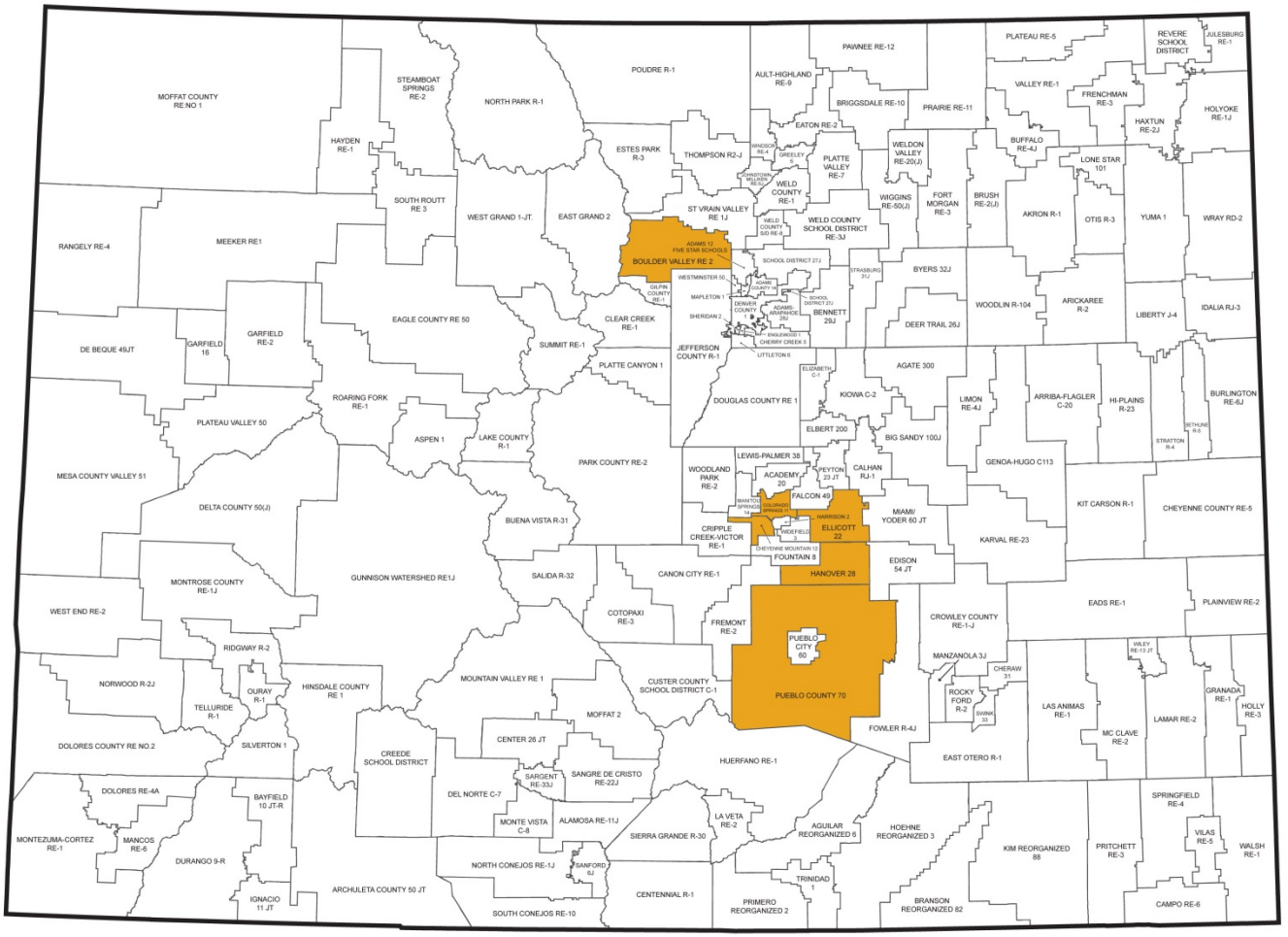
BASED ON A CURRICULUM OVERVIEW SAMPLE AUTHORED BY

Colorado Springs School District
- Grace C. Wright

Cheyenne Mountain School District
- Jonathan D. Ogg

Pueblo County School District
- Nicole A. Amidei

Boulder Valley School District
- Samantha Messier



This unit was authored by a team of Colorado educators. The template provided one example of unit design that enabled teacher-authors to organize possible learning experiences, resources, differentiation, and assessments. The unit is intended to support teachers, schools, and districts as they make their own local decisions around the best instructional plans and practices for all students.

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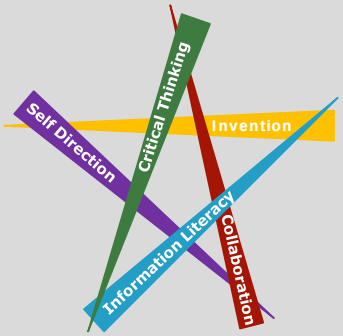
Content Area	Science	Grade Level	7th Grade
Course Name/Course Code			

Standard	Grade Level Expectations (GLE)	GLE Code
1. Physical Science	1. Mixtures of substances can be separated based on their properties such as solubility, boiling points, magnetic properties, and densities	SC09-GR.7-S.1-GLE.1
2. Life Science	1. Individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment	SC09-GR.7-S.2-GLE.1
	2. The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions	SC09-GR.7-S.2-GLE.2
	3. Cells are the smallest unit of life that can function independently and perform all the necessary functions of life	SC09-GR.7-S.2-GLE.3
	4. Photosynthesis and cellular respiration are important processes by which energy is acquired and utilized by organisms	SC09-GR.7-S.2-GLE.4
	5. Multiple lines of evidence show the evolution of organisms over geologic time	SC09-GR.7-S.2-GLE.5
3. Earth Systems Science	1. Major geologic events such as earthquakes, volcanic eruptions, mid-ocean ridges, and mountain formation are associated with plate boundaries and attributed to plate motions	SC09-GR.7-S.3-GLE.1
	2. Geologic time, history, and changing life forms are indicated by fossils and successive sedimentation, folding, faulting, and uplifting of layers of sedimentary rock	SC09-GR.7-S.3-GLE.2

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Reading & Writing Standards for Literacy in Science and Technical Subjects 6 - 12

Reading Standards

- Key Ideas & Details
- Craft And Structure
- Integration of Knowledge and Ideas
- Range of Reading and Levels of Text Complexity

Writing Standards

- Text Types & Purposes
- Production and Distribution of Writing
- Research to Construct and Present Knowledge
- Range of Writing

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Shake, Rattle, and Roll	3-5 weeks	6

Unit Title	Shake, Rattle, and Roll			**Length of Unit**	3-5 weeks
Focusing Lens(es)	Interactions Patterns	**Standards and Grade Level Expectations Addressed in this Unit**	SC.09-GR.7-S.3-GLE.1		
Inquiry Questions (Engaging-Debatable):	• If tectonic plates are constantly interacting, why don't people feel the movement? • Why do some countries have mountains and not others? Canyons?				
Unit Strands	Earth Science				
Concepts	Change, time, interaction, motion, force, tectonic plates, patterns, geologic events				

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth (SC.09-GR.7-S.3-GLE.1-EO.a)	What evidence supports the theory of plate tectonics? (SC.09-GR.7-S.3-GLE.1; IQ.2) What are the effects of plate movement along plate boundaries? (SC.09-GR.7-S.3-GLE.1; IQ.3) What are the constructive and destructive forces associated with volcanoes? (SC.09-GR.7-S.3-GLE.1)	How does the movement of plates affect life on Earth? (SC.09-GR.7-S.3-GLE.1-EO.b; IQ.3) Why do people continue to live at or near plate boundaries? (SC.09-GR.7-S.3-GLE.1; IQ.3) Why do most earthquakes and volcanoes occur at plate boundaries? (SC.09-GR.7-S.3-GLE.1; IQ.3)
Major events (changes) in geologic time form patterns evidenced in land formations and rock layers (SC.09-GR.7-S.3-GLE.1-EO.d)	How can major geologic events be attributed to plate movement? (SC.09-GR.7-S.3-GLE.1; IQ.1)	Why is understanding Earth's geologic history important today? (SC.09-GR.7-S.3-GLE.1; RA.1)
Interactions between tectonic plates and landforms result in natural events which can (positively or negatively) impact communities (SC.09-GR.7-S.3-GLE.1-EO.d; RA.2)	What types of natural hazards would one witness due to plate tectonics? (SC.09-GR.7-S.3-GLE.1-EO.c)	How does the movement of tectonic plates cause natural hazards? Would these hazards still exist if the tectonic plates did not move? (SC.09-GR.7-S.3-GLE.1-EO.c; RA.1)

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
● The components of the lithosphere (e.g., plates that move and interact) (SC.09-GR.7-S.3-GLE.1) ● The movements of tectonic plates and their effects (e.g., earthquakes, volcanoes, mountain formation, and mid-ocean ridges) (SC.09-GR.7-S.3-GLE.1) ● The major geologic events that attributed to plate movements (SC.09-GR.7-S.3-GLE.1; IQ.1) ● The effects of plate movement along plate boundaries (SC.09-GR.7-S.3-GLE.1; IQ.2) ● Geologic "hot spots" and how they are used in building design (SC.09-GR.7-S.3-GLE.1-EO.c; RA.2)	● Identify, interpret, and explain models of plate motions on Earth and how they cause major geologic events (SC.09-GR.7-S.3-GLE.1-EO.b) ● Gather, analyze, and communicate data that explains Earth's plates, plate motions, and the results of plate motions (SC.09-GR.7-S.3-GLE.1-EO.a) ● Use maps to locate likely geologic "hot spots", using evidence of earthquakes and volcanic activity (SC.09-GR.7-S.3-GLE.1-EO.c) ● Use web-based or other technology tools to show connections and patterns in data about tectonic plate boundaries and earthquakes, volcanic eruptions, and mountain formation ((SC.09-GR.7-S.3-GLE.1-EO.d) ● Trace the development of a scientific theory using the theory of plate tectonics (SC.09-GR.7-S.3-GLE.1; N.2) ● Describe the ethical traditions of science: value peer review; truthful reporting of methods and outcomes; making work public; and sharing a lens of professional skepticism when reviewing the work of others (SC.09-GR.7-S.3-GLE.1; N.3)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*Earth is composed of plates that interact and move in various ways, causing major geologic events such as earthquakes, volcanic eruptions, mid-ocean ridges, and mountain formations.*
Academic Vocabulary:	Theory, time scale, layers, analyze, simulation, models
Technical Vocabulary:	Lithosphere, sedimentation, eruption, earthquake, volcano, plate, plate boundaries, mid-ocean ridges, folding faulting, plate tectonics

Unit Description:	This unit focuses on plate tectonics at the three types of plate boundaries (convergent, divergent, transform) and the various geologic events, including land formations that occur due to their interactions (earthquakes, trenches, mountains, volcanoes, etc.). It then progresses into the results of their interactions, and their impacts on communities. The unit culminates in a performance assessment where students will take the role of a worldwide news cast team member that is reporting on 2 events (volcanic eruption, earthquake, tsunami, etc.).
Considerations:	One of the generalizations has been modified to better fit the instructional unit. This unit needs to be taught prior to geologic time and adaptations. Learning experience #6 may be taught after learning experience #3. **Misconceptions:** The outer layer of the earth – including the continents and the ocean basins - consists of separate plates. The earth's plates sit on a hot, slightly softened layer of the earth. The earth's plates move very slowly, pressing against one another in some places and pulling apart in other places. When continental plate material from one plate presses against another plate, the continental plate material is forced upward, forming mountains. When two plates are pulling apart, melted rock material rises up between the plates, creating new plate material. When continental plate material from one plate presses against another plate, the continental plate material is forced upward, forming mountains. When oceanic plate material from one plate presses against another plate, it can slide under the other plate, sinking deep into the earth.
Unit Generalizations	
Key Generalization:	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth.
Supporting Generalizations:	Major geologic events (changes) form patterns evidenced in land formations.
	Interactions between tectonic plates and landforms result in natural events which can (positively or negatively) impact communities.

Performance Assessment: *The capstone/summative assessment for this unit.*	
Claims: (Key generalization(s) to be mastered and demonstrated through the capstone assessment.)	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth.
Stimulus Material: (Engaging scenario that includes role, audience, goal/outcome and explicitly connects the key generalization)	You are on a worldwide news cast team that is reporting on 2 events (volcanic eruption, earthquake, tsunami, etc.). Your news cast team will research these events and their locations. The segment about these events must include a scientific explanation about how the processes at that boundary resulted in the event using the following information to support your broadcast: ● Visual representation of the event (diagram) ● The type of boundary the event occurred at ● An explanation of how plates are interacting at that boundary
Product/Evidence: (Expected product from students)	Students will take the role of a worldwide news cast team member that is reporting on 2 events (volcanic eruption, earthquake, tsunami, etc.). Your news cast team will research these events and their locations. The segment about these events must include a scientific explanation about how the processes at that boundary resulted in the event using the following

	information to support your broadcast: ● Visual representation of the event (diagram) ● The type of boundary the event occurred at ● An explanation of how plates are interacting at that boundary
Differentiation: (Multiple modes for student expression)	● Teacher may select the events for the students. ● Teacher may have students record their newscast or create a transcript. ● Teacher may provide software to make a "movie" (Moviemaker, iMovie, etc.) ● Teacher may determine the number of students per group.

Texts for independent reading or for class read aloud to support the content	
Informational/Non-Fiction	**Fiction**
Lasky, K. (1992). *Surtsey: The Newest Place on Earth.* [Lexile: 1110] Saunders, C. (2011). *What is the Theory of Plate Tectonics?* [Lexile: 920] Young, G. (2007). *Alfred Wegener: Uncovering Plate Tectonics. [*Lexile: 630] Townsend, J. (2005). *Earthquakes and Volcanoes: A Survival Guide. [*Lexile: 600] Rebman, R. (2011). *Anatomy of an Earthquake. [*Lexile: 790] Snedden, R. (2011). *Earth's Shifting Surface. [*Lexile 880] Talley, C. (2005). *Predicting Volcanic Eruptions and Earthquakes. [*Lexile: 980]	Gregory, K. (1994). *Earthquake at Dawn. [*Lexile: 840] McNulty, F. (1990). *How to Dig a Hole to the Other Side of the World. [*Lexile: 520] Reiss, K. (1998). *Paperquake: A Puzzle. [*Lexile: 700] Tarshis, L. (2013). *I Survived the Japanese Tsunami, 2011. [*Lexile: 650] Kehret, P. (2004). *Escaping the Giant Wave. [*Lexile: 750]

Ongoing Discipline-Specific Learning Experiences				
1.	Description:	Thinking like a scientist: Using the scientific method	Teacher Resources:	http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (Near middle of page teacher resources page with activities) http://undsci.berkeley.edu/teaching/misconceptions.php (A list of common misconceptions about the nature of science) http://undsci.berkeley.edu/teaching/ (Tips for introducing and teaching scientific method and experimentation) http://www.livescience.com/6727-invisible-gorilla-test-shows-notice.html (Video in which most people fail to observe large "gorilla" moving across room) http://www.shodor.org/succeed-1.0/forensic/teacher/lessons/observation.html (Lesson plan devoted to developing observation skills) http://blogs.loc.gov/teachers/2011/06/look-again-challenging-students-to-develop-close-observation-skills/ (Library of Congress brief of tools for helping students develop observation skills)
			Student Resources:	http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (At top of page student link for movie and activities about scientific method)

				http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation) http://www.brainpop.com/science/scientificinquiry/scientificmethod/preview.weml (Movie and quiz for scientific method/inquiry) http://lifehacker.com/5960811/how-to-develop-sherlock-holmes+like-powers-of-observation-and-deduction (Explanation of tools to increase observation skills with hook related to Sherlock Holmes)
	Skills:	Designing an experiment, identifying variables, and analyzing results.	Assessment:	Within the learning experiences
2.2.	Description:	Working like a scientist: Using graphing and mathematics skills	Teacher Resources:	Power Point presentation (Dealing with identification of dependent and independent variables) http://professionaldevelopment.ibo.org/files/ocd/TaughtPractice%20with%20%20identifying%20variables.pdf (Practice worksheet for identifying dependent and independent variables) http://www.clemson.edu/ces/phoenix/tutorials/graph/index.html (Rules for graphing) http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut9_bar.htm#line3 (Teaches how and why to use different graphs and also teaches how to read a graph) http://www.teachervision.fen.com/skill-builder/graphs-and-charts/48946.html?page=1&detoured=1 (Provides questions to ask students as they analyze a graph) http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)
			Student Resources:	http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)
	Skills:	Creating and interpreting graphs, creating data tables, creating and interpreting models.	Assessment:	Students may create graphs using data from learning experiences in order to analyze relationships between variables. Teachers may make real-time observations and provide feedback for students on their ability to set up a graph correctly.

Prior Knowledge and Experiences

Students will have a basic understanding of the Earth's layers.

Vertical Articulation: The last time students have seen the concepts within this unit was in 6th, 5th, and 3rd grades.

Learning Experience # 1-4
Instructional Timeframe: Weeks 1-2

Learning Experience # 1		
The teacher may provide a variety of learning opportunities so that students can analyze each layer of the Earth, including each layer's composition.		
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth.	
Teacher Resources:	http://tinyurl.com/lg8awrs (article about trying to reach earth's mantle) http://www.mrsoshouse.com/ext/earthl.html (can be used as a web quest) https://sites.google.com/site/mrdearthscience/unit-3-tectonics/plate-tectonics (web Quest) http://www.newhartfordschools.org/cms/lib07/NY01913833/Centricity/Domain/287/Science/Crust%20to%20Core%20KEY.pdf (image of earths layers) http://www.thesciencequeen.net/EarthFoldable.pdf (Foldable) http://www.aktsunami.org/lessons/58/unit3/atep_58_EarthsLayers.pdf (lab) http://www.aktsunami.org/lessons/58/unit3/atep_58_EarthsLayers.pdf (vocabulary, questions, wall cards, activities, and added links) http://lzk.me/label/label-earths-layers-worksheet.html (labeling project idea)	
Student Resources:	http://maggiesscienceconnection.weebly.com/layers-of-the-earth.html (study guide with visuals) https://ees.as.uky.edu/sites/default/files/elearning/module06swf.swf (Layers of Earth interactive) http://interactivesites.weebly.com/earths-structure.html (5 interactivers for earths layers) http://www.softschools.com/science/earth/game8.html (Sort the Words game) https://ethemes.missouri.edu/themes/561 (eThemes animation, interactive) https://www.youtube.com/watch?v=Q9j1xGaxYzY (video/song) https://www.youtube.com/watch?v=N9ncfAsmiSg (video) https://www.youtube.com/watch?v=XXTEWQdu3aE (video "Earths Core Explained")	
Assessment:	Students will identify certain phenomenon (magnetic field, plate motion, etc) that occur on the earth's surface by labeling the layers of the earth and justifying their claims in a short constructed response based off of the composition of each layer.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide an outline of each layer. The teacher may provide a fill-in-the blank worksheet.	N/A
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may have students create digital models of the Earth's layers.	Students may create a digital model of Earth's layers.

Critical Content:	• Theory of plate tectonics
Key Skills:	• Create a diagram of the Earth's layers • Label a diagram of Earth's layers • Identify the composition of each layer
Critical Language:	Analyze, composition, phenomenon, asthenosphere, lithosphere, convection currents, mantle, crust, tectonic plates

Learning Experience # 2		
The teacher may use simulations of plate movements throughout history so that students can explain the break-up of Pangaea and the continued movement of tectonic plates.		
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth	
Teacher Resources:	http://ajms.lancasterscschools.org/www/lcsdschools_ajms/site/hosting/index.htm#Introduction (plate tectonics creating board games) http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.lp_platetectonics/plate-tectonics (interactive, videos, history, maps, labs, etc.) https://jeopardylabs.com/play/7th-grade-plate-tectonics (plate tectonics jeopardy) http://www.windows2universe.org/teacher_resources/teach_snacktectonics.html (graham cracker lab) https://www.youtube.com/watch?v=ZjSaKKdZ3DI (video of graham cracker lab) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) http://jclahr.com/alaska/aeic/taurho/globe.pdf (plate tectonics 3-D globe) http://www.lpi.usra.edu/education/workshops/plateTectonics (activities, labs, and websites) http://alex.state.al.us/lesson_view.php?id=30754 (Pangaea puzzle activity with rubric) http://www2.sunysuffolk.edu/vorwalb/08_Plate%20Tectonics.pdf (identification and graphing lab) http://www.surfnetkids.com/resources/tectonics (includes printable articles) http://www.montoursville.k12.pa.us/webpages/creeder/notes_and_homework.cfm?subpage=1393412 Resources for Plate Tectonics and its effects	
Student Resources:	https://www.youtube.com/watch?v=UvIDxu7twpc (short video clip on pangea) http://msp.ehe.osu.edu/wiki/index.php/MSP:MiddleSchoolPortal/Plate_Tectonics:_Moving_Middle_School_Science (scroll down to multiple animations) http://oceanlink.island.net/SOLE/tectonics/WCDA.html (has link to real time data plate tectonic movement) http://www.ucmp.berkeley.edu/geology/tectonics.html (past tectonic interactive) https://www.youtube.com/watch?v=1-HwPR_4mP4 ("Plate Tectonics Documentary') https://www.youtube.com/watch?v=NMNNr2CyekA ("What can GPS tell us about Future Earthquakes") http://pubs.usgs.gov/gip/dynamic/dynamic.html Dynamic Earth http://www.sciencedaily.com/releases/2012/08/120809155831.htm (reading-scientist discover plate tectonics on mars)	
Assessment:	Students will demonstrate their comprehension of Pangaea by recreating the super-continent from modern land masses. Additionally, the students will produce a short constructed response predicting the future movement of continents and justifying their reasoning.	
Differentiation:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)

(Multiple means for students to access content and multiple modes for student to express understanding.)	The teacher may provide different scenarios/ pictures for students to choose from depicting future plate movements.	The student may express their prediction of future plate movement by using the manipulatives.
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	Students will include a time reference to their future predictions.
Critical Content:	● The concept of tectonic plates and their movement ● Wegner's theory of continental drift	
Key Skills:	● Label tectonic plates ● Label continents	
Critical Language:	Pangaea, convection currents, continental drift, tectonic plates	

Learning Experience # 3		
The teacher may show animations and use physical manipulatives representing tectonic plate interactions so that students can predict geologic events due to the constant motion of Earth's crust.		
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth.	
Teacher Resources:	http://nmayes.weebly.com/uploads/1/0/3/0/10302358/plate-boundary-foldable.pdf (2-D foldable) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) http://www.nps.gov/dena/learn/nature/upload/PBO_2012.pdf (reading component active boundary) https://www.youtube.com/watch?v=fBSDI0fWJPM (video basic tenants of plate tectonics) https://www.youtube.com/watch?v=NfVNnk8FHcU (Plate Tectonic video) http://glencoe.com/sites/common_assets/science/GES_511_1_G1.pdf (multiple boundary worksheets) http://emvc.geol.ucsb.edu/3_downloads/M1GTect/hWorldTect_pdfMaps/World_Tectonic_Maps.pdf (mapping activity) http://coast.noaa.gov/psc/seamedia/Lessons/G5U4L1%20The%20Earth%20is%20Cracking%20Up.pdf (graphic organizers, readings, labs, map of plate movement etc.,)	
Student Resources:	https://www.youtube.com/watch?v=XXTEWQdu3aE (Slip, Slide Collide interactive) http://www.wwnorton.com/college/geo/egeo2/content/animations/2_1.htm (boundary interactive) https://www.youtube.com/watch?v=dXDYoCqwSbM ("Plate Boundary/Convergent, Divergent, and Transform boundary" video) https://www.youtube.com/watch?v=kwfNGatxUJI (Plate Tectonic explained quick video) https://www.youtube.com/watch?v=dkELENdZukI (Mr. Comerford Plate Boundary rap) http://www.learner.org/interactives/dynamicearth/plate2.html (Plates and Boundaries Challenge) http://www.learner.org/interactives/dynamicearth/plate.html (map of plate boundaries)	
Assessment:	The students will identify 3 types of tectonic boundaries (convergent, divergent, and transform) and the force involved in each by labeling diagrams of plate interactions.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide a word bank listing the boundary types and forces.	N/A

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	The student may create a 3D representation of each boundary type.
Critical Content:	● The concept of plate boundaries ● The forces that correlate to the boundaries	
Key Skills:	● Label the plate motion at a given plate boundary ● Diagram what plate boundary would occur at different types of stress ● Analyze a world map	
Critical Language:	Boundary, plate, simulate, divergent boundary, convergent boundary, transform boundary, subduction, crust, mantle, and subduction	

Learning Experience # 4		
The teacher may supply visual and physical representations of Earth's crust so that the student can describe the impact that stress has on the formation of faults and folds.		
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth.	
Teacher Resources:	http://igs.indiana.edu/lessonplans/faultblock.pdf (lesson and templates for 3D fault blocks) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) http://igs.indiana.edu/lessonplans/faultblock.pdf (3-D foldable activity) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) http://igs.indiana.edu/lessonplans/faultblock.pdf (3-D foldable activity) http://ceetep.oregonstate.edu/files/7-world_map_of_plate_boundaries.pdf (student sheet & answer key) http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/15/FoamFaultActivity.pdf (foam fault activity)	
Student Resources:	https://ees.as.uky.edu/sites/default/files/elearning/module04swf.swf (interactive of boundaries, volcanoes, earthquakes, hot spots, velocity, ect.) http://tinyurl.com/nxla4wc (animation for plate boundaries) https://ees.as.uky.edu/sites/default/files/elearning/module10swf.swf (fault and fold interactive) http://serc.carleton.edu/NAGTWorkshops/structure/visualizations/folds_faults.html ("faults, Folds, and Shear Zones" interactives) http://data.gns.cri.nz/af/index.jsp ("New Zealand Active Fault Database") https://www.youtube.com/watch?v=BSsrm33tjN0 (folds, faults, and mountains") http://geology.com/plate-tectonics.shtml (Plate Tectonic/Boundary interactive map) http://education.nationalgeographic.com/education/encyclopedia/crust/?ar_a=1 (Earth's crust reading component)	
Assessment:	In small groups, the students will assemble 3D fault blocks and demonstrate their understanding of the movement and forces involved in each fault type via a short video. (V1) Students will identify several different examples of folds and faults and write an explanation of which stress caused the rock layers to be altered. (V2)	
Differentiation:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)

(Multiple means for students to access content and multiple modes for student to express understanding.)	The teacher may provide pre-assembled blocks. The student may work independently.	The student may demonstrate their comprehension of fault types with an oral presentation to the teacher.
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	The students may create a digital animation (PowerPoint) that illustrates their understanding of the movement of the three types of faults and the stresses involved in each.
Critical Content:	● Types of faults	
Key Skills:	● Identify the different types of faults ● Label the direction of movement that takes place during faulting ● Label features that form due to faulting ● Identify the type of fault given a real-life image where faulting took place	
Critical Language:	Compression, strike-slip, reverse, transform, fault, stress, tension, folds, compression, and shearing	

Learning Experiences # 5-7
Instructional Timeframe: Weeks 3-5

Learning Experience # 5	
The teacher may present articles and data on earthquakes across the globe so that students can analyze causes, means of measurement, and impacts of earthquakes.	
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth Interactions between tectonic plates and landforms result in natural events which can (positively or negatively) impact communities
Teacher Resources:	https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_natdis/cub_natdis_lesson03_activity1.xml (earthquake activity) http://www.geographypods.com/earthquakes--volcanoes.html (Geography 2015 and Beyond) http://study.com/academy/lesson/using-the-richter-scale-to-measure-earthquakes.html (video) http://www.shakeout.org/downloads/ShakeOut_ES5_MercalliScale.pdf (Lesson and activity) http://sbsciencematters.com/6th/earth-volcano/6.10RichterScale.pdf (Includes graphs and images) http://quake.geo.berkeley.edu (Northern California Earthquake Data Center) http://www.livescience.com/32099-whats-the-most-earthquake-prone-state-in-the-us.html (Trivia) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) p://www.geographypods.com/earthquakes--volcanoes.html (Geography 2015 and Beyond) http://wave.oregonstate.edu (wave cam) http://seplessons.ucsf.edu/node/110 (slinky lab to simulate earthquake waves)

	http://mjksciteachingideas.com/quakes.html (Marcia's earthquake ideas tons of pintables) www.walrus.wr.usgs.gov/tsunami/NAlegends.htm (Native American legends)	
Student Resources:	https://www.youtube.com/watch?v=VSgB1IWr6O4 (short video on earthquakes) https://www.youtube.com/watch?v=MRzzlJ4acUM (earthquake song) http://www.scholastic.com/browse/article.jsp?id=4892 (article on measuring earth quakes) https://www.youtube.com/watch?v=1qbg7orb1lc (video clip on the Richter scale - Bill Nye) http://siovizcenter.ucsd.edu/library/TLTC/TLTCmag.htm (Richter Scale iteractive) http://elearning.niu.edu/simulations/images/S_portfolio/Mercalli/Mercalli_Scale.swf ("Modified Mercalli Intensity Scale" interactive) http://www.themeter.net/sism_e.htm (Mercalli/Richter measure conversion) http://kids.nationalgeographic.com/explore/science/earthquake/ (earthquake article) http://www.weatherwizkids.com/weather-earthquake.htm (interactive website on earthquakes) http://wave.oregonstate.edu (wave cam) http://www.sciencecourseware.com/virtualearthquake/vquakeexecute.html ("Determining The Earthquake Epicenter")	
Assessment:	Students will triangulate the epicenter of an earthquake when given data and predict how much damage was done to the location based on the value given by the Richter scale or Modified Intensity Scale.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide a Richter scale range chart.	N/A
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide information on the Mercalli scale.	The students will create a SCR discussing the possible Mercalli rating of the above event and justifying their responses.
Critical Content:	• The order of magnitude of the Richter scale	
Key Skills:	• Triangulate the epicenter of an earthquake given seismic data	
Critical Language:	Richter scale, seismic waves, seismograph, earthquake, mudslide, tsunami, S-wave, P-wave, epicenter, focus, triangulation, tectonic earthquake, volcanic earthquake, collapse earthquake, explosion earthquake	

Learning Experience # 6	
The teacher may demonstrate how plate motion will create different geologic features so that students can connect plate motion with the changing surface of the planet.	
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth
Teacher Resources:	https://www.youtube.com/watch?v=HuSHOQ6gv5Y (time lapse) for mountain formation over millions of years) http://www.age-of-the-sage.org/tectonic_plates/boundaries_boundary_types.html (resources to review) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) http://pubs.usgs.gov/of/1999/ofr-99-0132 (sea floor spreading model activity) http://topex.ucsd.edu (satellite geodesy) http://jclahr.com/alaska/aeic/taurho/globe.pdf (plate tectonics 3-D globe)

	http://www.spokaneschools.org/cms/lib/WA01000970/Centricity/Domain/625/Complete%20GLAD%20Units/Plate%20Tectonics_6th.pdf (chants, poems, and songs) http://www.nps.gov/dena/learn/nature/upload/PBO_2012.pdf (reading component active boundary) http://oceanlink.island.net/SOLE/tectonics/WCDA.html (has link to real time data plate tectonic movement) http://www2.sunysuffolk.edu/vorwalb/08_Plate%20Tectonics.pdf (identification and graphing lab) http://www.sciencedaily.com/releases/2012/08/120809155831.htm (reading-scientist discover plate tectonics on mars) http://www.surfnetkids.com/resources/tectonics (includes printable articles) http://www.slideshare.net/allsaintsscience/7th-grade-ch-1-sec-5-theory-of-plate-tectonics after review section moves on to more in depth information http://coast.noaa.gov/psc/seamedia/Lessons/G5U4L1%20The%20Earth%20is%20Cracking%20Up.pdf (graphic organizers, readings, labs, map of plate movement ect.,) http://msp.ehe.osu.edu/wiki/index.php/MSP:MiddleSchoolPortal/Plate_Tectonics:_Moving_Middle_School_Science (scroll down to multiple animations)
Student Resources:	https://www.youtube.com/watch?v=HuSHOQ6gv5Y (time lapse) for mountain formation over millions of years) http://www.age-of-the-sage.org/tectonic_plates/boundaries_boundary_types.html (resources to review) http://www.indiana.edu/~g103/plate/plate2.html (boundaries and geologic formation interactive) http://earthguide.ucsd.edu/eoc/teachers/t_tectonics/p_seafloorspreading.html (Sea floor spreading interactive) http://tinyurl.com/bw6ehz5 (animation showing growth of a continent) https://www.youtube.com/watch?v=ZjSaKKdZ3DI (Geology Kitchen) https://www.youtube.com/watch?v=RUnLSFoqzYk ("Top 10 Unusual Landscapes of the World") https://www.youtube.com/watch?v=bGye6vlOpbY ("The Mid-Atlantic Ridge") https://www.youtube.com/watch?v=0cZYuBiVVYE ("The Great Rift Valley") https://www.youtube.com/watch?v=kO-OoSVZ9Tk ("How Mountains are Formed")
Assessment:	Given three plate boundaries, students will create a visual representation of all possible geologic features that could occur at each boundary.

Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide a word bank of geologic features. The teacher may provide a Cloze method paragraph describing plate boundaries and geologic features.	N/A
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	The students may enhance their visual presentation by researching real-world examples and photos of geologic formations.

Critical Content:	● Causes of geologic formations
Key Skills:	● Identify causes of geologic features ● Distinguish boundary type when analyzing geologic features
Critical Language:	Mid-ocean ridge, rift valley, trench, mountain, subduction zone, feature, sea-floor spreading, magma chamber, orogenic formations

Learning Experience # 7
The teacher may present articles, data, and videos of various volcanoes (formation, structure, shape, viscosity, etc.) so the

student can analyze the composition and the impact of different types of volcanoes.		
Generalization Connection(s):	Tectonic plates, which are in constant motion, interact to induce geologic events due to forces within the Earth Interactions between tectonic plates and landforms result in natural events which can (positively or negatively) impact communities	
Teacher Resources:	http://tinyurl.com/mjmfaac (image for before/after of Mt. St. Helens; and composite volcanoes) http://perri-n-natural-hazards.wikispaces.com/1.+What+is+a+Volcano+-+History+and+Types+of+Volcanoes (Resources for teachers) https://sites.google.com/site/hartlandmiddleschoolscience/Home/7th-grade-science-1/7th-grade-earth-science/ring-of-fire-webquest-assignment (Ring of Fire web quest) http://olc.region10.org/21/wp-content/uploads/2013/07/Plate-Tectonics-and-Lava-Lamps-Lab.pdf (lava lamp lab) http://www.rsc.org/Education/Teachers/Resources/jesei/volcano/teachers.pdf (volcano lab requires heat) http://www.conservation.ca.gov/cgs/information/Pages/3d_papermodels.aspx (dream site of geology 3-D foldables) p://www.geographypods.com/earthquakes--volcanoes.html (Geography 2015 and Beyond) http://www.volcano.si.edu/learn_products.cfm?p=9 (Global Volcanism Program) http://serc.carleton.edu/NAGTWorkshops/assess/activities/srogi.html (lab using volcano scenarios: Hazard maps and communication risk)	
Student Resources:	http://tinyurl.com/mjmfaac (image for before/after of Mt. St. Helens; and composite volcanoes) https://sites.google.com/site/hartlandmiddleschoolscience/Home/7th-grade-science-1/7th-grade-earth-science/ring-of-fire-webquest-assignment (Ring of Fire web quest) http://www.volcanoesalive.com/ (videos and resources) http://study.com/academy/lesson/earthquakes-and-volcanoes-evidence-of-earths-inner-layers.html (video) http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES10/ES10.swf (quick video on types) http://www.cosmeo.com/braingames/virutal_volcano/index.cfm?title=Virtual%20Volcano (interactive) http://environment.nationalgeographic.com/environment/natural-disasters/volcano-profile/ (video) http://www.iknowthat.com/ScienceIllustrations/volcano/science_desk.swf ("A Volcanic Eruption" interactive)	
Assessment:	Create a before/after diagram of one type of volcano demonstrating: -how the volcano was formed -the shape of the volcano -a description of how the volcano erupted -the level of lava viscosity -how the volcano would appear after an eruption compared to before the eruption -the type of volcano the student is diagramming	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	The student may orally present the information requested in the assessment.
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)

	N/A	The student may create a digital animation fulfilling the requirements of the assessment.
Critical Content:	• Formation of different volcano types	
Key Skills:	• Distinguish amongst the types of volcanoes.	
Critical Language:	Cinder-cone volcano, shield volcano, composite volcano, magma chamber, lava, magma, viscosity, gas, crater, active, dormant, extinct	