
Moving, Exploding Earth



Third-Grade Teacher Resource Guide

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Moving, Exploding Earth: Lesson Summary and Vocabulary

Lesson Summary: YSI's *Moving, Exploding Earth* program offers students a comprehensive overview of geological forces. Students will first work with the instructors to discuss the earth and identify its composition. A food-based model provides an early snack and helps students visualize the layers of the earth and how they move. From there, students split into two groups to cycle between 'plate tectonics' and 'rocks and minerals' stations. In the first, they recreate tectonic forces and discover the nature of different boundaries and the earthquakes they produce. In the second, they learn how minerals can be combined and form into rocks, and how one type of rock can transform into another. Lastly, programs scheduled at YSI facilities will go on an instructor-led hike to observe some of the features and forces of our local earth. Throughout the program, students will be challenged to address and respond to a wide range of open-ended questions and help their classmates build a better picture of the planet we live on.

Vocabulary: Below are words and concepts that relate to the *Moving, Exploding Earth* program.

Convergent: a type of boundary where plates come together; colliding or merging

Core: the iron and nickel center of the earth; includes a solid inner core and liquid outer core

Crust: the solid outer layer of the earth, the crust is more dense under the ocean and less dense under the continents

Divergent: a type of boundary where plates move apart; splitting

Earthquake: strong vibrations in the lithosphere caused by motion at faults and boundaries

Erosion: the process by which the surface of the earth is worn away by wind, water, or other natural forces

Igneous: a type of rock produced by the heat of a volcano; literally "born in fire"

Lava: melted rock that has exited the surface of the earth

Magma: melted rock just below the surface of the earth's crust

Mantle: the semisolid portion of the earth between the crust and the core

Metamorphic: a type of rock that has changed forms due to extreme heat and pressure

Mineral: a naturally occurring, inorganic, crystalline solid

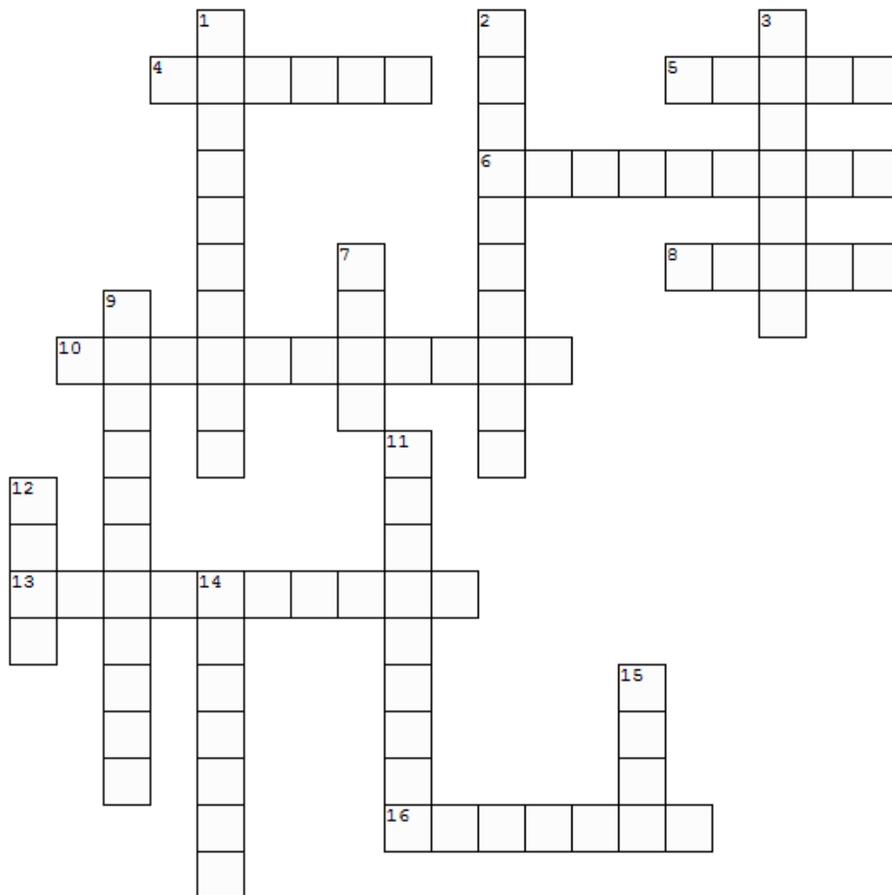
Rock: a substance composed of mineral matter put together under heat or pressure

Sedimentary: a type of rock formed by small deposited particles that are compressed over time

Subduction: the process by which one tectonic plate is pushed or driven under another

Transform: a type of boundary where plates move sideways to each other; change

Moving, Exploding Earth Language Arts Crossword Puzzle



MANTLE	MAGMA	CRUST	METAMORPHIC	DIVERGENT	ROCK	CONVERGENT	EROSION
SEDIMENTARY	EARTHQUAKE	TRANSFORM	MINERAL	SUBDUCTION	IGNEOUS	LAVA	
			CORE				

Across

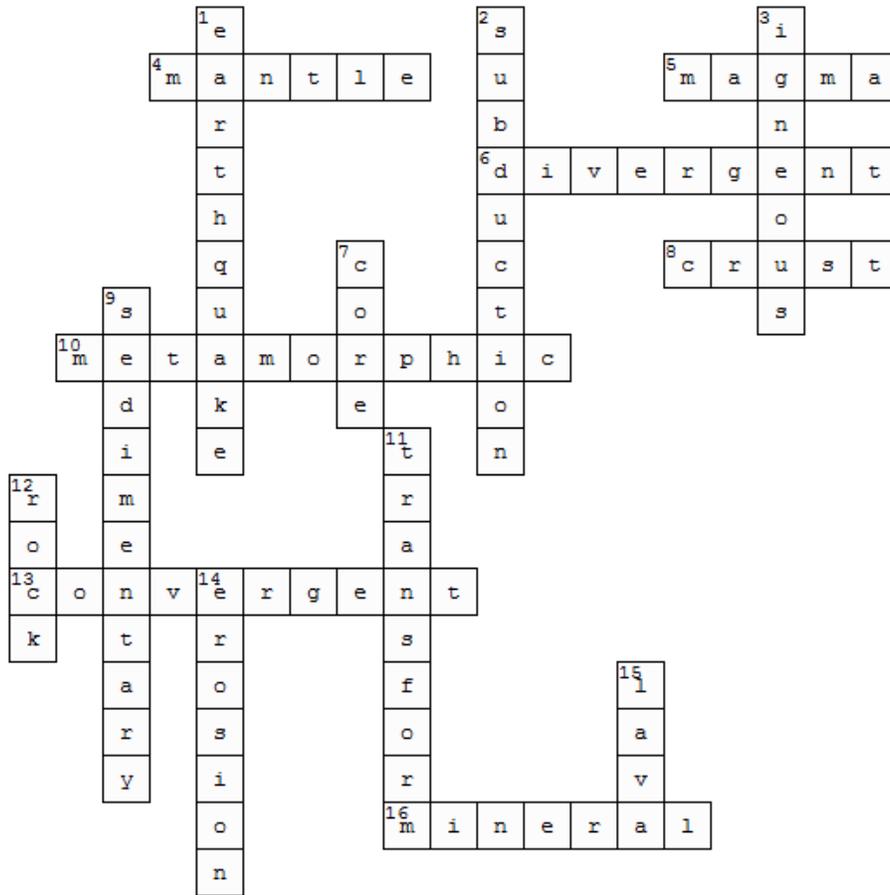
- The semisolid portion of the earth between the crust and the core.
- Melted rock just below the surface of the earth's crust.
- A type of boundary where plates move apart; splitting.
- The solid outer layer of the earth.
- A type of rock that has changed form due to extreme heat and pressure.
- A type of boundary where plates come together; colliding or merging.
- An inorganic crystalline solid.

Down

- Strong vibrations in the earth's crust caused by motion at faults and boundaries.
- The process by which one tectonic moves under another.
- Rock produced by the heat of a volcano.
- The iron and nickel center of the earth; includes a solid inner part and liquid outer part.
- Rock formed from small deposited particles that are compressed over time.
- A type of boundary where plates slide sideways past each other.
- A substance made of mineral matter that is mixed together under heat or pressure.
- The process by which the surface of the earth is worn away by wind, water, or other natural forces.
- Melted rock that has exited the surface of the earth.

Answer Key

Moving, Exploding Earth Language Arts Crossword Puzzle



Across

4. The semisolid portion of the earth between the crust and the core (**mantle**).
5. Melted rock just below the surface of the earth's crust (**magma**).
6. A type of boundary where plates move apart; splitting (**divergent**).
8. The solid outer layer of the earth (**crust**).
10. Rock that has changed form due to extreme heat and pressure (**metamorphic**).
13. A type of boundary where plates come together; colliding or merging (**convergent**).
16. An inorganic crystalline solid (**mineral**).

Down

1. Strong vibrations in the earth's crust caused by motion at faults and boundaries (**earthquake**).
2. The process by which one tectonic plate is pushed or driven under another (**subduction**).
3. A type of rock produced by the heat of a volcano; literally "born in fire" (**igneous**).
7. The iron and nickel center of the earth; includes a solid inner part and liquid outer part (**core**).
9. Rock formed from small deposited particles that are compressed over time. (**sedimentary**).
11. A type of boundary where plates slide sideways past each other (**transform**).
12. A substance made of mineral matter that is mixed together under heat or pressure (**rock**).
14. The process by which the surface of the earth is worn away by wind, water, or other natural forces (**erosion**).
15. Melted rock that has exited the surface of the earth (**lava**).

Language Arts Word Search

Moving, Exploding Earth

Circle the vocabulary in the word search below. Can you find all the earth-related words?

I	Q	S	W	Y	E	L	T	N	A	M	C	D	D	I	F
K	N	J	T	Y	V	L	A	B	G	A	M	T	W	S	W
T	N	E	G	R	E	V	I	D	F	E	S	M	U	H	H
S	G	C	F	F	K	I	A	Y	T	U	R	O	X	F	Z
Y	E	G	O	F	L	V	X	A	R	O	E	N	B	Y	R
U	R	D	S	N	A	I	M	C	F	N	U	O	O	E	C
O	G	S	I	L	V	O	T	S	G	E	V	I	G	C	W
D	F	F	E	M	R	E	N	I	U	B	S	T	I	O	O
W	C	R	P	P	E	A	R	R	Z	R	O	C	K	R	T
V	M	C	H	D	R	N	G	G	X	G	V	U	N	E	N
T	J	I	H	T	H	F	T	M	E	S	V	D	O	O	S
L	C	R	R	R	S	F	M	A	N	N	P	B	I	Y	X
M	I	N	E	R	A	L	D	G	R	N	T	U	S	K	J
K	Q	R	F	Q	F	Q	Y	M	X	Y	R	S	O	Q	V
P	C	X	W	T	O	B	R	A	H	O	D	W	R	G	T
N	U	I	E	A	R	T	H	Q	U	A	K	E	E	F	J

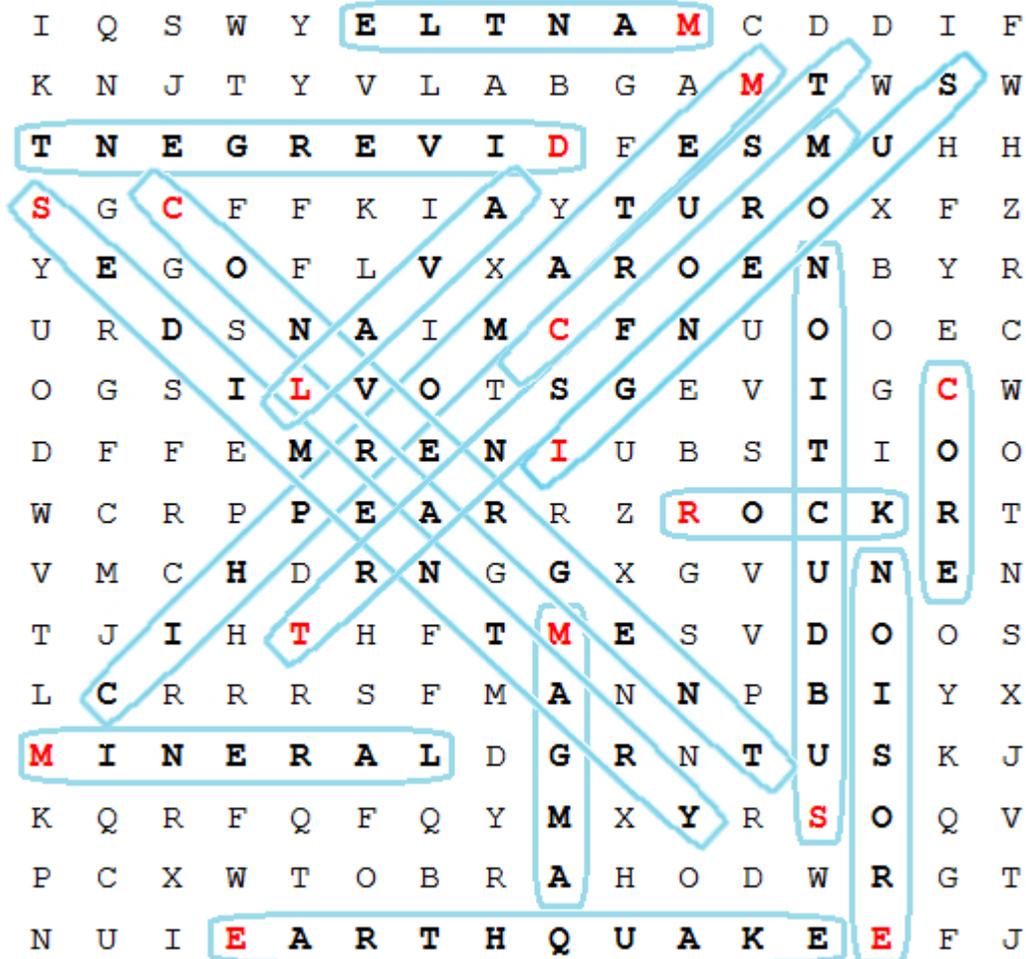
Word Bank

CONVERGENT
CORE
CRUST
DIVERGENT
EARTHQUAKE

EROSION
IGNEOUS
LAVA
MAGMA
MANTLE
METAMORPHIC

MINERAL
ROCK
SEDIMENTARY
SUBDUCTION
TRANSFORM

Answer Key
Language Arts Word Search
Moving, Exploding Earth



Word Bank

CONVERGENT
CORE
CRUST
DIVERGENT
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Moving, Exploding Earth: Extension Activities

The extension activities listed below are from RAFT (Resource Area For Teaching). RAFT educational content is available online (www.raftbayarea.org) at no cost and is aligned to California Science Standards and Next Generation Science Standards. Below is a selection of post-visit activities from RAFT to build on student learning about geology and the forces that make up our planet.

[RAFT Idea: Playing with the Rock Cycle - Resource Area For Teaching - RAFT Bay Area](#)

Grades Covered: 2 through 8

Subjects Covered: Physical Science, Earth/Space Science

Curriculum topics: Rocks and Minerals, Rock Cycle, Patterns of change

Description: Given enough time, everything changes...

<http://www.raftbayarea.org/ideas/Playing%20with%20the%20Rock%20Cycle.pdf>

[RAFT Idea: On A Roll With Geologic Time – Resource Area For Teaching – RAFT Bay Area](#)

Grades Covered: 2 through 12

Subjects Covered: Life Science, Earth/Space Science, Math

Curriculum topics: Geologic Time, Earth History, Scale

Description: Shrink billions of years and Earth's significant events...

<http://www.raftbayarea.org/ideas/On%20a%20Roll%20with%20Geologic%20Time.pdf>

[RAFT Idea: Be Prepared – Resource Area For Teaching – RAFT Bay Area](#)

Grades Covered: 3 through 12

Subjects Covered: Earth/Space Science, Social Studies

Curriculum topics: Natural Hazards, Emergency Preparedness, Community Studies

Description: Evaluate potential natural hazards and develop plans to address the danger.

<http://www.raftbayarea.org/ideas/Be%20Prepared.pdf>

Moving, Exploding Earth: Education Standards

Our Moving Exploding Earth program will contribute to students' ability to meet the California Science Content Standards, Common Core, and Next Generation Science Standards listed on the following pages.

California Science Content Standards Third Grade:

Physical Sciences: 1. Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept:

- c. *Students know* energy can be carried from one place to another by waves, such as water waves and sound waves, by electric current, and by moving objects.
- d. *Students know* matter has three forms: solid, liquid, and gas.
- e. *Students know* evaporation and melting are changes that occur when objects are heated.
- f. *Students know* that when two or more substances are combined, a new substance may be formed with properties that are different from those of the original materials.

Investigation and Experimentation: 5. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- a. Repeat observations to improve accuracy and know that the results of similar scientific investigations seldom turn out exactly the same because of differences in the things being investigated, methods being used, or uncertainty in the observation.
- c. Use numerical data in describing and comparing objects, events, and measurements.
- d. Predict the outcome of a simple investigation and compare the result with the prediction.
- e. Collect data in an investigation and analyze those data to develop a logical conclusion.

Excerpted from CA State Standards: <http://www.cde.ca.gov/>

Common Core Third Grade:

Speaking and Listening Standards: Students will...

1. Engage effectively in a range of collaborative discussions with diverse partners on grade 3 topics, building on others' ideas and expressing their own clearly.
 - a. Come to discussions prepared, having read or studied material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
 - b. Follow agreed-upon rules for discussions.
 - c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
 - d. Explain their own ideas and understanding in light of the discussion.
2. Determine the main ideas and supporting details of information presented orally.
3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Excerpted from Common Core Standards: <http://www.corestandards.org/>

Moving, Exploding Earth: Education Standards

Next Generation Science Standards Third Grade: Forces and Interactions

- **3-PS2-1:** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
 - **Science and Engineering Practices:**
 - **Planning and Carrying Out Investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
 - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1)
 - **Disciplinary core ideas:**
 - **PS2.A: Forces and Motion:** Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object’s speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)
 - **Crosscutting Concepts**
 - **Cause and Effect:** Cause and effect relationships are routinely identified. (3-PS2-1)

Interdependent Relationships in Ecosystems

- **3-LS4-1:** Analyze and interpret evidence from fossils to provide evidence of the organisms and the environments in which they lived long ago.
 - **Science and Engineering Practices:**
 - **Analyzing and Interpreting Data:** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
 - Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)
 - **Disciplinary core ideas:**
 - **LS4.A: Evidence of Common Ancestry and Diversity:** Some kinds of plants and animals that once lived on Earth are no longer found anywhere (3-LS4-1)
 - Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1)
 - **Crosscutting Concepts**
 - **Scale, Proportion, and Quantity:** Observable phenomena exist from very short to very long time periods. (3-LS4-1)

Excerpted from NGSS: <http://www.nextgenscience.org/>