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# Moving, Exploding Earth



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## Second-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 earth's crust 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

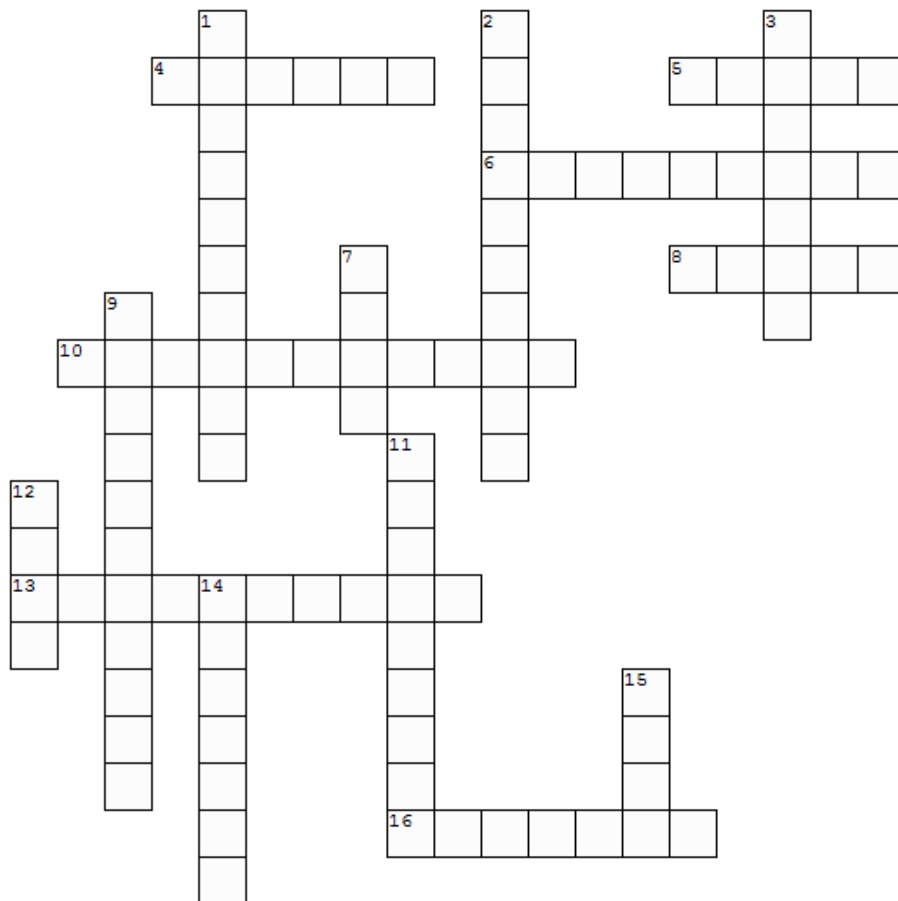
**Sedimentary:** a type of rock formed by small deposited particles that are compressed over time

**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

Definitions based on [www.dictionary.reference.com](http://www.dictionary.reference.com)

## Moving, Exploding Earth Language Arts Crossword Puzzle



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

**Across**

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

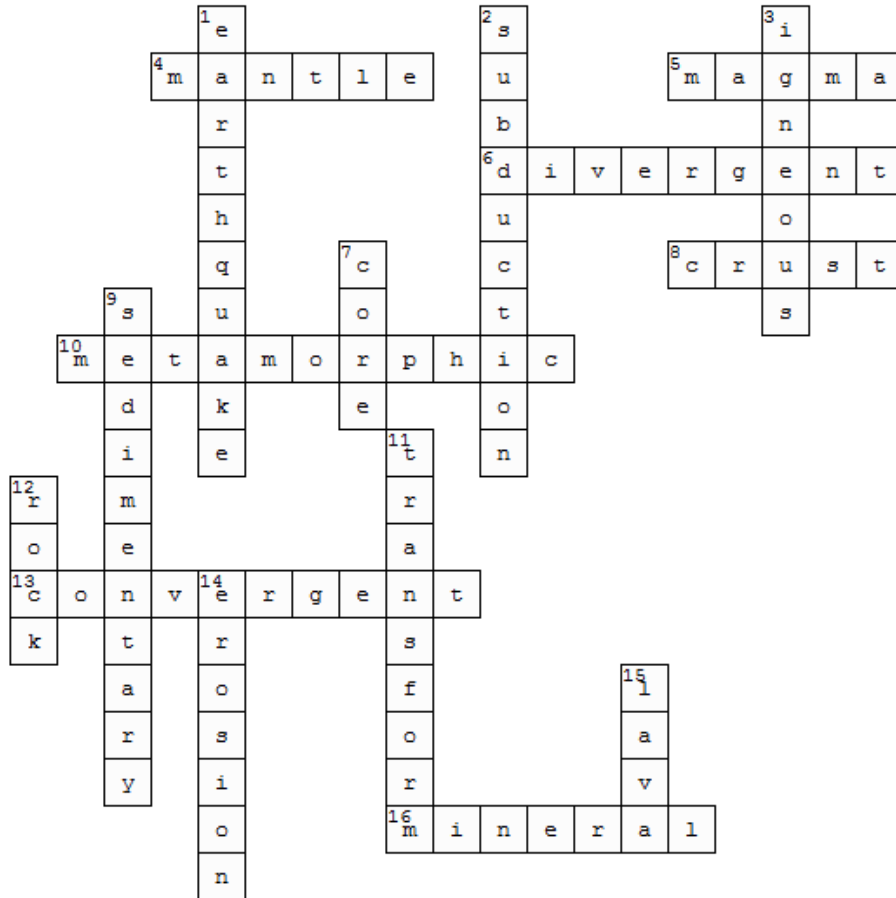
**Down**

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

## Answer Key

### Language Arts Crossword Puzzle

### Animals and their Adaptations



#### 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

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### 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  
EARTHQUAKE

EROSION  
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MANTLE  
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MINERAL  
ROCK  
SEDIMENTARY  
SUBDUCTION  
TRANSFORM

## **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](http://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 Second Grade:**

**Physical Sciences: 1.** The motion of objects can be observed and measured. As a basis for understanding this concept:

- c. *Students know* the way to change how something is moving is by giving it a push or a pull. The size of the change is related to the strength, or the amount of force, of the push or pull.

**Earth Sciences: 3.** Earth is made of materials that have distinct properties and provide resources for human activities. As a basis for understanding this concept:

- a. *Students know* how to compare the physical properties of different kinds of rocks and know that rock is composed of different combinations of minerals.
- b. *Students know* smaller rocks come from the breaking and weathering of larger rocks.
- c. *Students know* that soil is made partly from weathered rock and partly from organic materials and that soils differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.
- d. *Students know* that fossils provide evidence about the plants and animals that lived long ago and that scientists learn about the past history of Earth by studying fossils.
- e. *Students know* rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use.

**Investigation and Experimentation: 4.** 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. Make predictions based on observed patterns and not guessing.
- c. Compare and sort common objects according to two or more physical attributes (e.g. color, shape, texture, weight).
- g. Follow oral instructions for a scientific investigation.

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

### **Common Core Second Grade:**

**Speaking and Listening Standards:** Students will...

1. Participate in collaborative conversations with diverse partners about grade 2 topics with peers and adults in small and larger groups.
  - a. Follow agreed-upon rules for discussions.
  - b. Build on others' talk in conversations by linking their topics to the remarks of others.



## Moving, Exploding Earth: Education Standards

- c. Ask for clarification and further information as needed about the topics under discussion.
2. Recount or describe key information from information presented orally.
3. Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or clarify something that is not understood.

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

### Next Generation Science Standards Second Grade: Structure and Properties of Matter

- **2-PS1-1:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
  - **Science and Engineering Practices:**
    - **Planning and Carrying Out Investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
    - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)
  - **Disciplinary core ideas:**
    - **PS1.A: Structure and Properties of Matter:** Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
  - **Crosscutting Concepts**
    - **Patterns:** Patterns in the natural and human designed world can be observed. (2-PS1-1)
- **2-PS1-3:** Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
  - **Science and Engineering Practices:**
    - **Constructing Explanations and Designing Solutions:** Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
    - Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3)
  - **Disciplinary core ideas:**
    - **PS1.A: Structure and Properties of Matter:** Different properties are suited to different purposes. (2-PS1-3)
    - A great variety of objects can be built up from a small set of pieces. (2-PS1-3)
  - **Crosscutting Concepts**
    - **Energy and Matter:** Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

### Earth's Systems: Processes that Shape the Earth

- **2-ESS1-1:** Use information from several sources to provide evidence that Earth events can happen quickly or slowly.

## Moving, Exploding Earth: Education Standards

- **Science and Engineering Practices:**
  - **Constructing Explanations and Designing Solutions:** Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
  - Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-ESS1-1)
- **Disciplinary core ideas:**
  - **ESS1.C: The History of Planet Earth:** Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)
- **Crosscutting Concepts**
  - **Stability and Change:** Things may change slowly or rapidly. (2-ESS1-1)
- **2-ESS2-3:** Obtain information to identify where water is on the Earth and that it can be solid or liquid.
  - **Science and Engineering Practices:**
    - **Obtaining, Evaluating, and Communicating Information:** Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
    - Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)
  - **Disciplinary core ideas:**
    - **ESS2.C: The Roles of Water in Earth’s Surface Processes:** Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)
  - **Crosscutting Concepts**
    - **Patterns:** Patterns in the natural world can be observed. (2-ESS2-3)

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