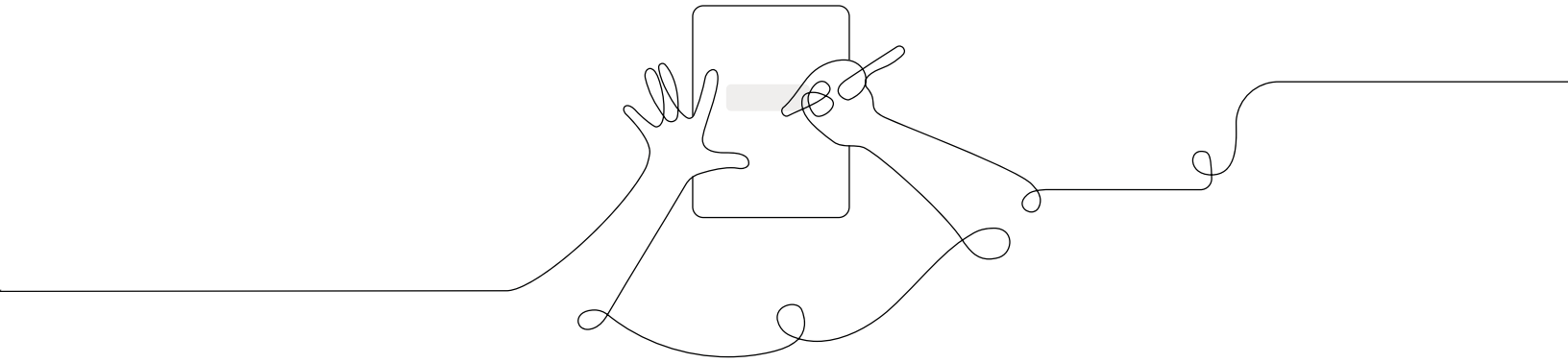
AmplifyScience

Participant Notebook

Grade 7: Rock Transformations
Guided Unit Internalization with @Home Resources



Unit Guide resources

Once a unit is selected, select **JUMP DOWN TO UNIT GUIDE** in order to access all unit-level resources in an Amplify Science unit.

Planning for the unit

Unit Overview	Describes what's in each unit, the rationale, and how students learn across chapters
Unit Map	Provides an overview of what students figure out in each chapter, and how they figure it out
Progress Build	Explains the learning progression of ideas students figure out in the unit
Getting Ready To Teach	Provides tips for effectively preparing to teach and teaching the unit in your classroom
Materials and Preparation	Lists materials included in the unit's kit, items to be provided by the teacher, and briefly outlines preparation requirements for each lesson
Science Background	Adult-level primer on the science content students figure out in the unit
Standards at a Glance	Lists NGSS Standards (Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts), Common Core State Standards for English Language Arts, and Common Core State Standards for Mathematics

Teacher references

Lesson Overview Compilation	Lesson Overview of each lesson in the unit, including lesson summary, activity purposes, and timing
Standards and Goals	Lists NGSS (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts) and CCSS (English Language Arts and Mathematics) standards in the unit, explains how the standards are reached
3-D Statements	Describes 3-D learning across the unit, chapters, and in individual lessons
Assessment System	Describes components of the Amplify Science assessment system, identifies each 3-D assessment opportunity in the unit
Embedded Formative Assessments	Includes full text of formative assessments in the unit
Articles in This Unit	Summarizes each unit text and explains how the text supports instruction
Apps in This Unit	Outlines functionality of digital tools and how students use them (in grades 6-8)
Flextensions in This Unit	Summarizes information about the Hands-On Flextension lesson(s) in the unit

Printable resources

Coherence Flowcharts	Visual representation of the storyline of the unit
Copymaster Compilation	Compilation of all copymasters for the teacher to print and copy throughout the unit
Flextension Compilation	Compilation of all copymasters for Hands-on Flextension lessons throughout the unit
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting
Multi-Language Glossary	Unit vocabulary words in 10 languages
NGSS Information for Parents and Guardians	Information for parents about the NGSS and the shifts for teaching and learning
Print Materials (8.5" x 11")	Digital compilation of printed cards (i.e. vocabulary cards, student card sets) provided in the kit
Print Materials (11" x 17")	Digital compilation of printed Chapter Questions and Key Concepts provided in the kit

Unit Map

Why are rock samples from the Great Plains and from the Rocky mountains composed of such similar minerals, when they look so different and come from different areas?

Taking on the role of student geologists, students investigate a geologic puzzle: two rock samples, one from the Great Plains and one from the Rocky Mountains, look very different but are composed of a surprisingly similar mix of minerals. Did the rocks form together and somehow get split apart? Or did one rock form first, and then the other rock form from the materials of the first rock? To solve the mystery, students learn about how rock forms and transforms, driven by different energy sources.

Chapter 1: How did the rock of the Great Plains and the rock of the Rocky Mountains form?

Students figure out: The rock of the Great Plains is sedimentary rock and the rock of the Rocky Mountains is igneous rock. They formed in different ways so they must not have formed together. Rocks can form in different ways. This causes them to be different types. When sediment is compacted and cemented together, it forms sedimentary rock. When magma cools, it hardens to form igneous rock.

How they figure it out: They observe rock samples and explore the Simulation, finding different ways to make rock form. They model the formation of sedimentary rocks using hard candy, and view a video showing igneous rock formation as magma cools. They create a visual model showing two different ways rocks can form. They evaluate evidence based on how detailed observations are.

Chapter 2: Where did the magma and sediment that formed the rock of the Great Plains and the rock of the Rocky Mountains come from?

Students figure out: It is possible that the rock of the Great Plains formed from sediment that eroded off the Rocky Mountains. It might also be possible that the rock of the Rocky Mountains formed from the rock of the Great Plains if the Great Plains rock were somehow carried underground to where energy from Earth's interior could melt it into magma. Matter gets transformed by energy, but the same matter is still present. Sediment forms when any type of rock is weathered, a process driven by energy from the sun. Magma forms when any type of rock is melted, a process driven by energy from Earth's interior.

How they figure it out: They find ways to cause magma and sediment to form in the Sim, then observe which of these processes are driven by energy from the Sun and which are driven by energy from Earth's interior. They watch a video that illustrates the processes of weathering and erosion. They read an article about the geologic history of Devils Tower. They model the formation of sediment using hard candy, and watch a video demonstration of a hard candy model of magma formation. They write about ways that different energy sources affect rock and create new visual models. They read and conduct Sim missions related to rocks in Hawaii in order to review chapter content.

Chapter 3: How could rock from one of the regions have transformed into a different type of rock in the other region?

Students figure out: The plate motion that occurred near the Great Plains and Rocky Mountains uplifted igneous rock that formed underground. This rock eventually eroded and its sediment formed sedimentary rock in the Great Plains. Plate motion moves rock formations. Subduction moves rock down, below Earth's outer layer. Uplift moves rock upward, toward Earth's surface. Uplift and subduction can expose rock formations to different energy sources, which can transform them. Any type of rock can transform into any type of rock because of plate motion.

How they figure it out: They read an article about the oldest rocks on Earth and how plate motion affects rock transformations. They conduct Sim missions attempting to transform certain types of rock to other types. They engage in a classroom model that illustrates the many possible transformations that rock material may undergo. They write about how rock material may come to be exposed to different types of energy, and therefore undergo different types of transformations, and they create their final visual model.

Chapter 4: Students apply what they learn to a new question—What rock transformation processes are happening on Venus?

Students consider whether rock transformations on Venus are producing mostly sedimentary rocks or mostly igneous rocks. They evaluate and analyze photographic and descriptive evidence, and also analyze evidence about energy sources on the planet. They engage in oral argumentation in a student-led discourse routine called a Science Seminar and then write final arguments.

Chapters at a Glance

Unit Question

How do rocks form and change?

Chapter 1: Rock Formations

Chapter Question

How did the rock of the Great Plains and Rocky Mountains form?

Investigation Questions

- How do rocks form? (1.3, 1.4, 1.5)

Key Concepts

- Rocks can form in different ways. This causes them to be different types. (1.4) ?
- When sediment is compacted and cemented together, it forms sedimentary rock. (1.4) ?
- When magma cools, it hardens to form igneous rock. (1.4)

Chapter 2: Sediment and Magma

Chapter Question

Where did the magma and sediment that formed the rock of the Great Plains and the Rocky Mountains come from?

Investigation Questions

- What causes sediment and magma to form? (2.1, 2.2, 2.3, 2.4)

Key Concepts

- Matter gets transformed by energy, but the same matter is still present. (2.3) ?
- Sediment forms when any type of rock is weathered, a process driven by energy from the sun. (2.3) ?
- Magma forms when any type of rock is melted, a process driven by energy from Earth's interior. (2.3)

Chapter 3: Movement of Rock Formations

Chapter Question

How could rock from one of the regions have transformed into a different type of rock in the other region?

Investigation Questions

- How do rock formations move between the surface and Earth's interior? (3.1, 3.2) ?
- How do uplift and subduction lead to the transformation of rocks? (3.2, 3.3)

Key Concepts

- Plate motion moves rock formations. (3.2) ?
- Subduction moves rock down, below Earth's outer layer. (3.2) ?
- Uplift moves rock upward toward Earth's surface. (3.2) ?
- Uplift and subduction can expose rock formations to different energy sources, which can transform them. (3.3) ?
- Any type of rock can transform into any type of rock because of plate motion. (3.3)

Chapter 4: Rock Transformations on Venus

Chapter Question

What rock transformation processes are happening on Venus?

Progress Build

Each Amplify Science Middle School unit is structured around a unit-specific learning progression, which we call the Progress Build. The unit's Progress Build describes the way students' explanatory understanding of the unit's focal phenomena is likely to develop and deepen over the course of a unit. It is an important tool in understanding the structure of a unit and in supporting students' learning: it organizes the sequence of instruction (generally, each level of the Progress Build corresponds to a chapter), defines the focus of assessments, and grounds the inferences about student learning progress that guide suggested instructional adjustments and differentiation. By aligning instruction and assessment to the Progress Build (and therefore to each other), evidence about how student understanding is developing may be used during the course of the unit to support students and modify instruction in an informed way.

The *Rock Transformations* Progress Build consists of three levels of science understanding. To support a growth model for student learning progress, each level encompasses all of the ideas of prior levels and represents an explanatory account of unit phenomena, with the sophistication of that account increasing as the levels increase. At each level, students add new ideas and integrate them into a progressively deeper understanding of how rocks form and transform. Since the Progress Build reflects an increasingly complex yet integrated explanation, we represent it by including the new ideas for each level in bold.

Prior knowledge (preconceptions). At the start of the *Rock Transformations* unit, middle school students will have had experience with sediment—such as sand or gravel—in their daily lives, whether in a playground or at the beach. They are likely to be familiar with magma or lava from popular media, though they may not have considered its connection to rock formations. It is expected that students have completed the Amplify Science *Plate Motion* unit, or a similar unit on plate tectonics that covers how tectonic plates move and interact at their boundaries. If students have had the Amplify Science grade 2 unit *Changing Landforms* and grade 4 unit *Earth's Features*, they will be familiar with the concepts of how rock breaks down into smaller pieces, and how sediment can move and accumulate in layers. This experience and prior knowledge can be built upon and refined, which is what the *Rock Transformations* Progress Build and unit structure are designed to do.

Progress Build Level 1: Rocks that form in different ways are different types of rock.

Rock formations can be made in different ways, which cause them to become different rock types. One type is made from small pieces of rock material called sediment. When the sediment gets buried and pressed together, over time it hardens into one type of rock formation called sedimentary rock. Another type of rock formation is made from liquid rock material called magma; when it cools, it hardens into a rock type called igneous rock.

Progress Build Level 2: Material for rock formations can come from rock formations that are weathered or melted.

Rock formations can be made in different ways, which cause them to become different rock types. One type is made from small pieces of rock material called sediment. When the sediment gets buried and pressed together, over time it hardens into one type of rock formation called sedimentary rock. Another type of rock formation is made from liquid rock material called magma; when it cools, it hardens into a rock type called igneous rock. **The material that forms new rock comes from existing rock formations. Sediment is small pieces of rock that have been broken down from a rock formation at the surface of Earth. The small pieces are created by the movement of wind and water. The energy for this comes from the sun, and therefore these processes can only happen at the surface, where there is sun energy, air, and water. The melted rock (magma) that hardens to form new rock comes from existing rock deep below the surface of Earth. Energy from inside Earth melts the existing rock into magma.**

Progress Build Level 3: Rock formations can move between Earth's surface and its interior, which can lead to their transformation.

Rock formations can be made in different ways, which cause them to become different rock types. One type is made from small pieces of rock material called sediment. When the sediment gets buried and pressed together, over time it hardens into one type of rock formation called sedimentary rock. Another type of rock formation is made from liquid rock material called magma; when it cools, it hardens into a rock type called igneous rock. The material that forms new rock comes from existing rock formations. Sediment is small pieces of rock that have been broken down from a rock formation at the surface of Earth. The small pieces are created by the movement of wind and water. The energy for this comes from the sun, and therefore these processes can only happen at the surface, where there is sun energy, air, and water. The melted rock (magma) that hardens to form new rock comes from existing rock deep below the surface of Earth. Energy from inside Earth melts the existing rock into magma. **Any type of rock can be transformed into any type of rock because of plate motion. A rock can be transformed when it is moved to a place where a different energy source can affect it, and therefore it can go through a different process. Plate motion can cause both subduction and uplift of rock. In subduction, rock (and rock material) is carried from the top of the outer layer to beneath it, where it is exposed to energy from Earth's interior. Uplift brings rock material toward the top of the outer layer, where it can be exposed to sun energy and weathering.**

Guided Unit Internalization Planner

Part 1: Unit-level internalization

Unit title:

What is the phenomenon students are investigating in your unit?

Unit Question:

Student role:

By the end of the unit, students figure out ...

What science ideas do students need to figure out in order to explain the phenomenon?

Multi-day planning, including planning for differentiation and evidence of student work

<table>
<tr><td colspan="4">Day _____</td></tr>
<tr><td colspan="2">Minutes for science: _____

Instructional format:
❑ Asynchronous
❑ Synchronous</td><td colspan="2">Minutes for science: _____

Instructional format:
❑ Asynchronous
❑ Synchronous</td></tr>
<tr><td colspan="2">Lesson or part of lesson:

Mode of instruction:
❑ Preview
❑ Review
❑ Teach full lesson live
❑ Teach using synchronous suggestions
❑ Students work independently using:
❑ Printed @Home Slides
❑ Digital @Home Slides
❑ @Home Videos</td><td colspan="2">Lesson or part of lesson:

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❑ @Home Videos</td></tr>
<tr><td>Students will…</td><td>Teacher will…</td><td>Students will…</td><td>Teacher will…</td></tr>
</table>

Look at the *Students will* columns. What are students working in the lesson(s) above that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn't a work product listed above, do you want to add one? Make notes below.

Some Types of Written Work in Amplify Science

- Daily written reflections
- (6-8) Homework tasks
- (K-5) Investigation notebook pages
- Written explanations (typically at the end of Chapter)
- Diagrams
- Recording pages for Sim uses, investigations, etc

How will students submit this work product to you?
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.

Completing Written Work	Submitting Written Work
• Plain paper and pencil (videos include prompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

Multi-day planning, including planning for differentiation and evidence of student work

Day _____

Minutes for science: _____

Instructional format:
- ❑ Asynchronous
- ❑ Synchronous

Lesson or part of lesson:

Mode of instruction:
- ❑ Preview
- ❑ Review
- ❑ Teach full lesson live
- ❑ Teach using synchronous suggestions
- ❑ Students work independently using:
  - ❑ Printed @Home Slides
  - ❑ Digital @Home Slides
  - ❑ @Home Videos

Students will…	Teacher will…

Minutes for science: _____

Instructional format:
- ❑ Asynchronous
- ❑ Synchronous

Lesson or part of lesson:

Mode of instruction:
- ❑ Preview
- ❑ Review
- ❑ Teach full lesson live
- ❑ Teach using synchronous suggestions
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Suggestions for synchronous time

The following are some ideas for making the most of synchronous time with your students. As a general rule, the best way to use your synchronous time is to provide students opportunities to talk to one another, or to observe or visualize things they could not do independently.

Online synchronous time	Notes
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc. **Digital tool demonstrations:** You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool. **Interactive read-alouds**: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom. **Shared Writing:** This is a great opportunity for a collaborative document that all your students can contribute to. **Co-constructed class charts:** You can create digital charts, or create physical charts in your home with student input.	

Notes