Amplify Science CALIFORNIA

Grades K–8

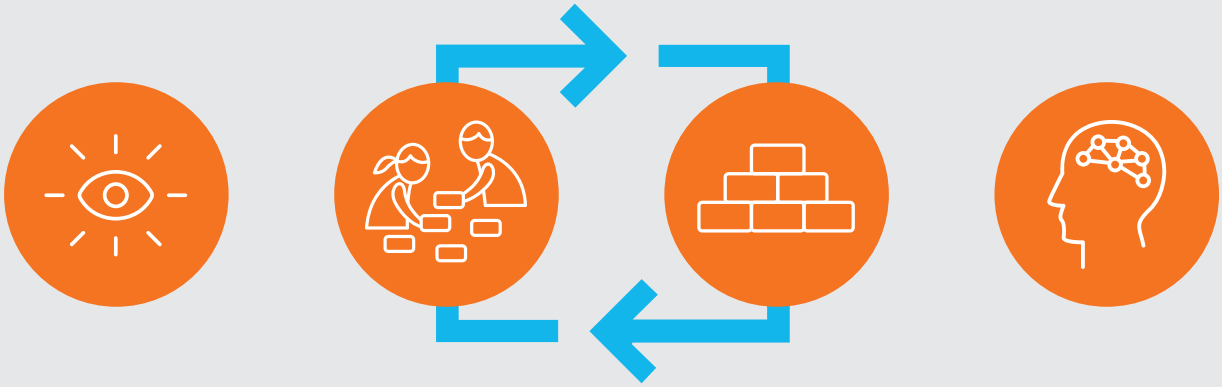
Amplify Science and the 5E Model

Our learning approach

In many science programs, the 5Es frame each lesson. Students are **engaged** with an opening activity to generate interest in the material and access prior knowledge. They **explore** key concepts and skills and begin to build understanding of cause and effect relationships. They articulate their new understandings during the **explain** section, and then **elaborate** on their learning by applying knowledge to a new situation. Finally, the lesson closes with an **evaluation** opportunity. Students in Amplify Science classrooms will experience these phases of learning over the course of an entire unit.

In Amplify Science, each unit's anchor phenomenon and supporting narrative drive the instruction and integration of the three dimensions of the NGSS—science and engineering practices, disciplinary core ideas, and crosscutting concepts.

While you will not find the 5Es explicitly labeled within Amplify Science, students do go through the phases of learning defined in the 5E model. Similarly, Amplify Science uses several other models, including our proven Do, Talk, Read, Write, Visualize model—an immersive approach to learning ideas—as well as the well-established Gradual Release of Responsibility, a model that supports students' becoming proficient in engaging in science and engineering practices. Students benefit from these multiple powerful learning models embedded in robust instructional units with storylines based on anchor phenomena and 21-century problems.



Engage students with a real-world problem

Explore evidence from multiple sources

Construct increasingly complex explanations

Apply knowledge to solve a new problem

Amplify Science and the 5Es

Engage

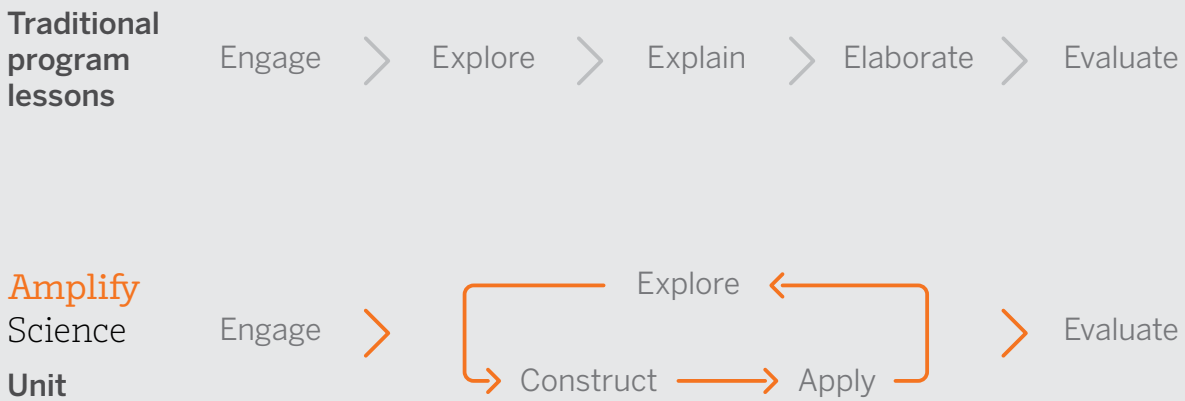
Amplify Science makes use of a problem-based approach to establish engagement. Each unit begins with the introduction of a compelling problem whose solution involves students in figuring out how a science phenomenon works or solving a design challenge. With the problem and supporting story played out over the course of the entire unit, Amplify Science students experience ongoing, deep, and sophisticated engagement with figuring out the anchor phenomenon.

Explore-Explain-Elaborate

In each chapter of an Amplify Science unit, students engage in the core of the 5E learning cycle. This core, based on the Atkins-Karplus learning cycle, uses different words to describe a highly similar process: Explore-Construct-Apply. Students use a variety of materials to explore ideas, make connections, construct models and robust scientific explanations and scientific arguments, and finally apply that deeper conceptual understanding toward more nuanced insights into the phenomena.

Evaluate

Amplify Science provides multiple vehicles for students (and teachers) to reflect on and assess student learning: oral scientific argumentation, end-of-unit writing assignments, regular student self-assessments, and, in middle school, multiple choice and written response questions.



In other programs you can see the 5Es play out on a smaller scale within an individual lesson, in Amplify Science you will see the 5E elements woven throughout the unit.

Looking for the 5Es in Amplify Science

See below for select examples taken from the ***Weather Patterns*: Severe Storms in Galetown** Unit that show the 5E progression across a unit. Each description of a phase comes directly from the lesson overviews in the unit. Some lessons are not included in this example.

Engage

In Lesson 1.2 students review parts of the water cycle and are introduced to their role as student forensic meteorologists conducting research for Dr. Kenji Emerson, a forensic meteorologist. They learn about the case they will investigate during the course of the unit: explaining why the rainstorms in Galetown are more severe than they used to be. Students are introduced to the unit claims: whether the new lake, warmer temperatures, or stronger than normal wind contribute to the higher amounts of rain that the town is experiencing.

The purpose of this lesson is to orient students to their role and the problem they are solving in this unit, while also initiating and building upon their prior knowledge about the water cycle and how rain forms.

Explore

In Lesson 1.3 students begin by reviewing evaporation to help set up the background knowledge needed to explore condensation. Next, students investigate how and when condensation happens in order to answer the Investigation Question: What makes rain happen? They take an in-depth look at the process of condensation and learn that condensation is evidence of energy transfer. During a hands-on activity, students observe that all air contains water and investigate the factors that lead to condensation in an air parcel. Students then explore condensation in the Weather Patterns Simulation to gather data that energy transfer is what leads to cooling which can then lead to condensation and rain.

The purpose of this lesson is to provide students an opportunity to discover how energy transfer and cooling cause condensation, which can lead to rain.

In Lesson 1.5 students determine why air parcels cool by further investigating energy transfer in air parcels. They reread a section of the article "What Are Clouds?" in order to better understand how energy drives the process of cloud formation. Next, they use the Simulation to explore the connection between temperature and energy transfer as well as how energy transfer relates to rainfall. They conclude the lesson by watching a video about weathering and erosion as a way to extend their understanding of how precipitation interacts with other parts of the Earth system. This lesson helps students to synthesize thinking about the water cycle, energy transfer, condensation, and rainfall, and to make connections to other parts of the Earth system.

The purpose of this lesson is for students to understand when energy transfers out of an air parcel and how this transfer can affect cloud formation and rainfall.

Weather Patterns: Severe Storms in Galetown

Explain

In Lesson 1.6 students receive important data from Dr. Emerson related to the storms in Galetown before and after the lake was built. Students then participate in a vocabulary routine to help them reflect on the Chapter 1 Question: What causes the rainfall in Galetown? Students show their ideas and explain their thinking about the lake's effect on rainfall through the use of the Modeling Tool and a written explanation. In the final activity of the lesson, students read an article that helps them to understand how conduction, convection, and radiation all work to transfer heat through Earth's system and contribute to making Death Valley one of the hottest places on Earth.

The purpose of this lesson is for students to use what they have learned about what makes rain happen to analyze the data and begin to explain what might be causing the severe rainstorms in Galetown.

Elaborate

In Lesson 3.3 students examine the factors that contribute to a rainstorm by comparing them across different rainstorms in Galetown. They are given a data table that presents these factors for four different weather events in Galetown. Students use the data from this table to explain which factor or factors were most important as the driver of severe rainstorms. They then create a model to depict their understanding of the last factor, wind, and its effect on a rainstorm. This and the other models they have created in previous chapters constitute an important part of the final report that they have been working toward throughout the unit. Students get a chance to look back and discuss the models they have created in the last two chapters in preparation for completing the written portion of the final report about why the most recent storm was very severe in Galetown.

The purpose of this lesson is to reflect on and apply the key concepts learned in this unit to the situation in Galetown.

Evaluate

In Lesson 4.3 students engage in oral argumentation as they grapple with ideas about what causes rainstorms. Students prepare for the Science Seminar by revisiting and continuing to organize their thinking about the claims and evidence, using their Argument Organizers. They then participate in the Science Seminar, a group discussion in which students make sense of evidence and debate which claims are best supported. For homework, students craft a final written argument. The Science Seminar gives students an authentic context for applying what they have learned about the mechanisms that cause rainfall. The structure of the Science Seminar provides a unique student-centered argumentation experience.

The purpose of this lesson is for students to apply what they learned throughout the unit as they engage in oral scientific argumentation.

For more information about the Amplify Science California program structure and components, visit amplify.com/california.

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