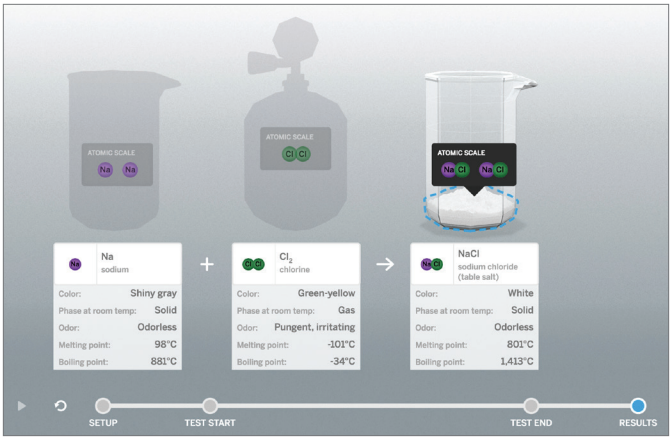
Introduction

Developed exclusively for Amplify Science, digital simulations, or "sims," are interactive, virtual worlds that allow students to discover and construct understanding of science concepts and phenomena. Sims provide students with opportunities to explore scientific phenomena that might otherwise be challenging to investigate in a classroom because they are too small, large, slow, distant, dangerous, or difficult to manipulate directly. Much like real scientists do, students in Amplify Science use technology to explore and investigate phenomena, observe and identify relationships, model processes, make predictions, gather evidence, and apply their understanding of science concepts.

Chemical Reactions

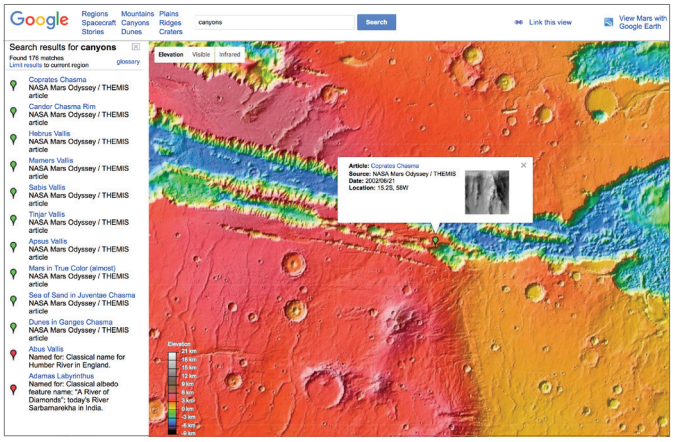
The Chemical Reactions sim offers students the opportunity to explore chemical reactions on several levels. Students observe details and properties of numerous substances and run tests on a smaller set of substances to see if they react to form new substances. The sim allows students to learn about the connection between the arrangement of atoms and the formation of different substances with different properties. Students can observe how atoms rearrange to form new substances during a reaction and learn about how matter is conserved in these reactions.



Geology on Mars

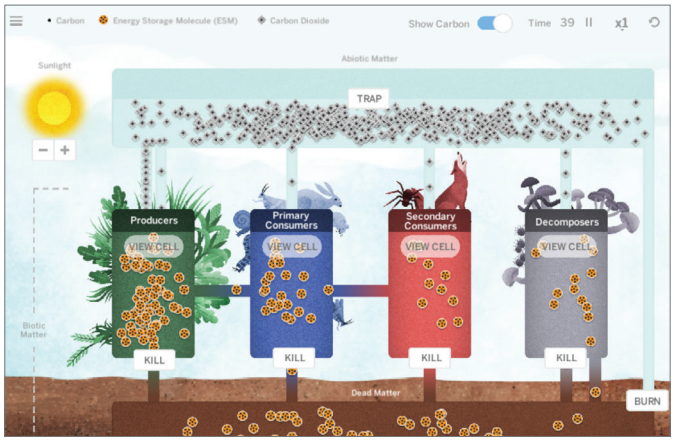
In the Geology on Mars unit, students use Google Mars™ to explore landforms on the surface of Mars. This provides students with experience in analyzing and interpreting data, a Next Generation Science Standard: Science and Engineering Practice.

Google Mars™ was created by Google® and NASA researchers at Arizona State University. Over the past 50 years, scientists have used different instruments and cameras that they've placed on satellites, landers, and rovers to collect information about the surface of Mars. Google Mars™ is an interactive mapping service that allows students to directly examine the information that has been collected about the surface of Mars.



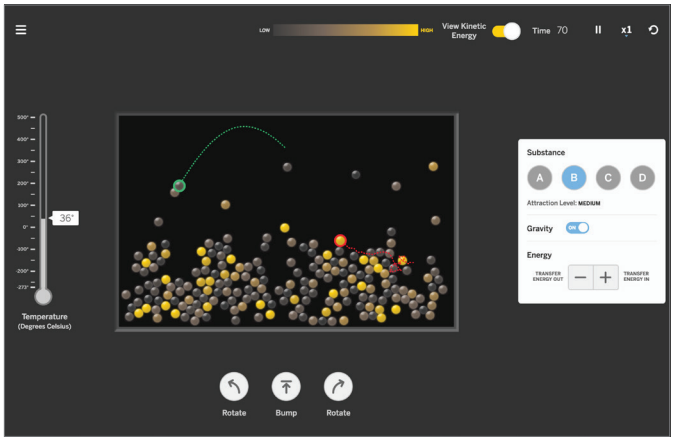
Copyright NASA / JPL / GSFC / Arizona State University

Matter and Energy in Ecosystems



The Matter and Energy in Ecosystems sim shows how the movement of carbon through an ecosystem is affected by changes to parts of that ecosystem. Students can use the preset closed ecosystem or set up their own ecosystems by selecting the number of organisms of each type, the amount of dead matter, and the amount of carbon dioxide in abiotic matter. Students will be able to observe how carbon in abiotic and biotic matter changes over time, but see that the total amount of carbon does not change. While the sim is running, students can change the level of sunlight, kill organisms, burn and bury dead matter, and trap carbon dioxide to see how each change affects the movement of carbon through the closed ecosystem.

Phase Change



The Phase Change sim is an interactive, scientific model of several substances at the molecular scale. It provides students with the ability to investigate molecular behavior in substances, and explore what happens to molecules when substances change phase. The four substances in the sim have different levels of attraction between molecules, allowing students to investigate how molecular attraction affects phase change. Students can select a substance and transfer energy into or out of the substance in order to understand the behavior of solids, liquids, and gases at both the macroscopic and molecular scales. At the molecular scale, students can influence and closely observe how molecules move. Students can also observe the behavior of the substance in response to macroscale changes to the conditions of the container. These changes include bumps, rotations, and changes to gravity.

Phase Change: Engineering Internship

The Futura BabyWarmer Design Tool is a digital model that allows students to test various portable baby incubator designs by adding and testing different phase change materials (PCMs) and insulating materials. Students then analyze numerical data on a graph to evaluate their designs. Students use the BabyWarmer Design Tool multiple times throughout the unit to iteratively optimize and evaluate their designs.

Phase Change: Engineering Internship

The Plate Motion sim is an interactive model that allows students to observe the interactions between plates and the mantle at different types of plate boundaries. The sim enables students to manipulate and investigate the effects of a number of variables that affect plate motion, including the boundary type, the composition of the plates (oceanic or continental rock), and the rigidity of the mantle. After setting the initial conditions for a region, students can watch the motion of the plates over a timespan of 200 million years. Students can measure how far the plates move in this time, investigate plate-mantle interactions, and observe patterns of earthquakes and volcanoes that occur near the plate boundaries.

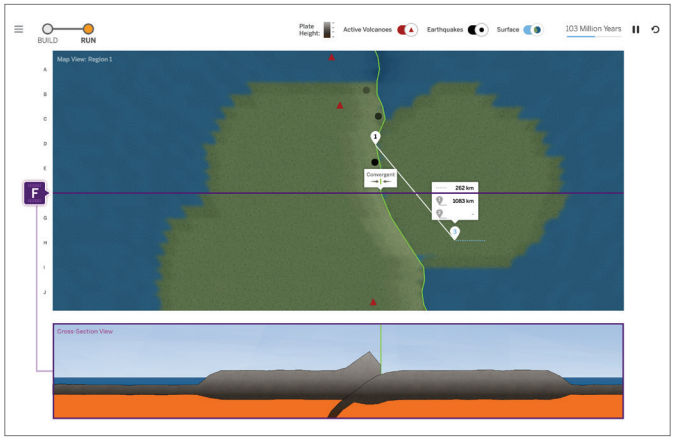
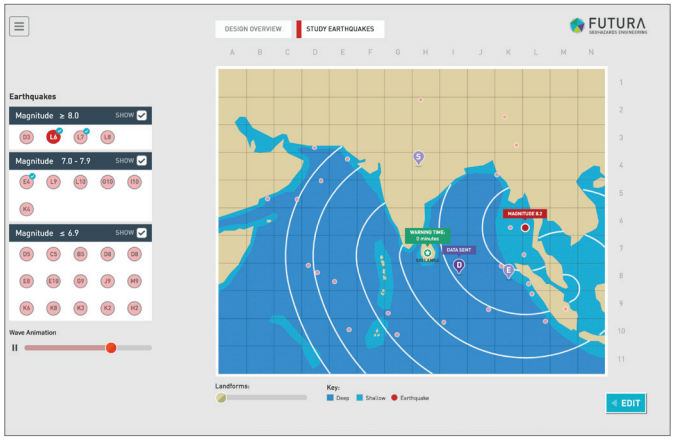


Plate Motion: Engineering Internship

The Futura Tsunami Alert Design Tool is a digital model that allows students to test various tsunami warning system designs. Students try many combinations of sensor types and locations in their designs to observe how the system performs in this 50-year predictive model, working to maximize average warning time for the people of Sri Lanka while minimizing false alarms and keeping costs low. When students analyze a design, they evaluate how each sensor performed, and then study each earthquake to better understand which sensors were involved in which types of warnings for the target location, Sri Lanka.



Populations and Resources

The Populations and Resources sim is a dynamic, interactive virtual ecosystem that shows how populations interact with one another. The sim allows students to observe stable ecosystems as well as change the numbers of organisms in a certain population to observe how this affects other populations in the ecosystem. Students can view interactions between individual organisms, and open the food web overlay to observe interactions between populations.

Rock Transformations

The Rock Transformations sim shows rock formations and transformations driven by different energy sources over millions of years. Students observe how different rock types form, change, and move at and below Earth's surface. They also observe how the landscape changes as these processes occur. Students can either directly apply different transformation processes to their landscape using the Process mode, or they can select energy sources in Energy mode and observe the transformations that occur. In both modes, students can analyze the rock formations they have created using the Analyze Rocks feature. This feature allows students to view the distribution of igneous, sedimentary, and metamorphic rocks in the landscape and to select individual rock formations to learn more about their composition and characteristics.