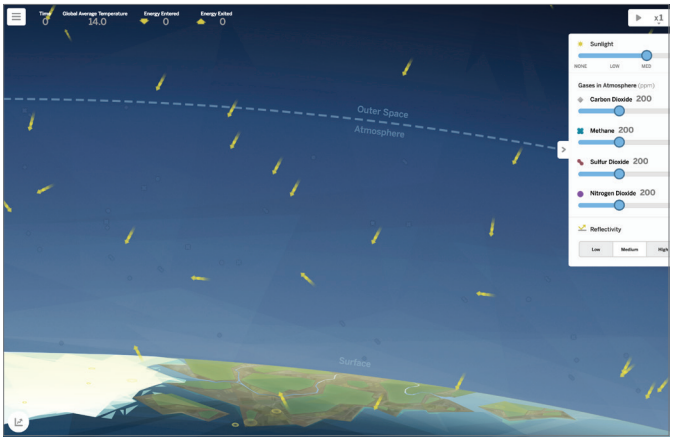
Introduction

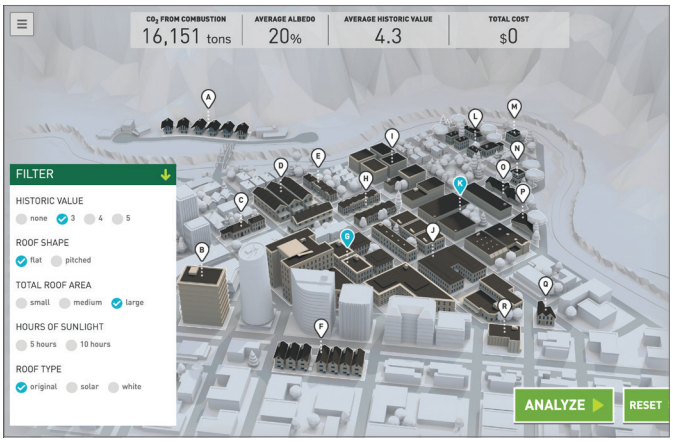
Developed exclusively for Amplify Science, digital simulations, or "sims," are interactive, virtual worlds that allow students to discover and construct understanding of science concepts and phenomena. Sims provide students with opportunities to explore scientific phenomena that might otherwise be challenging 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.

Earth's Changing Climate



Earth's Changing Climate sim is an interactive model with two modes: Earth System mode and Human Activities mode. Earth System mode allows students to investigate factors that affect Earth's global average temperature. Students can change the amount of sunlight, atmospheric gas concentrations, or surface reflectivity, and then evaluate the effects on temperature, ice cover, and energy absorbed by Earth's surface. Human Activities mode focuses on the impact of human actions on Earth's climate. Changes in human activities or population size are represented in real time both visually (through interactions of energy and matter in Earth's surface and atmosphere), as well as quantitatively (through graphs and numerical readouts)

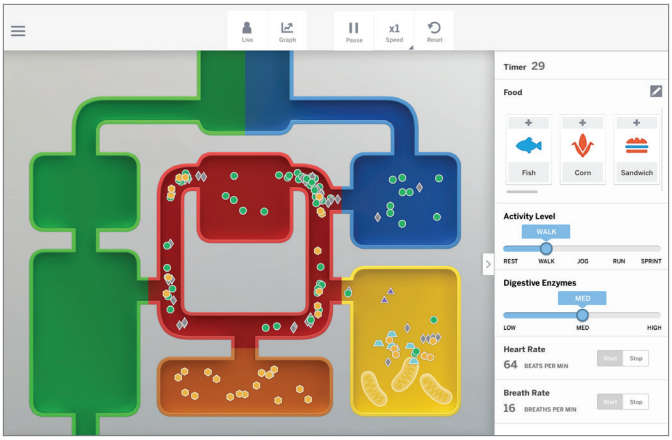
Earth's Changing Climate: Engineering Internship



The RoofMod Design Tool is a digital model that allows students to test various roof modification designs for the fictional city of Solton. This tool offers students the ability to explore a model of the city by studying the various buildings to determine which roof modifications to apply. Students can try a variety of roof combinations in each design to observe the cause and effect of their design decisions. When a student analyzes the design, the numerical outputs are presented with summary graphs to compare how the design performed compared to the original, unmodified roofs. Students use the design tool multiple times throughout the design cycle in order to iterate the roof modification strategies.

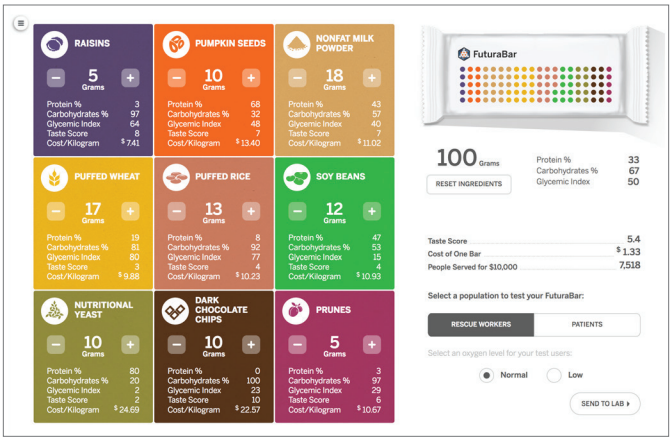
Metabolism

The Metabolism sim models how human body systems work together to transport molecules from food and air to the body's cells, and how these molecules are used in the cells to release energy in the process of cellular respiration. Students can feed the body different types of food, change the body's activity level, stop and start the heart and breathing, and manipulate the enzyme levels in the digestive system to observe the effects on cellular respiration in the cells of the body. Metabolic processes are displayed visually through molecule interactions in a schematic representation of the body, as well as quantitatively in graphs and numerical readouts.



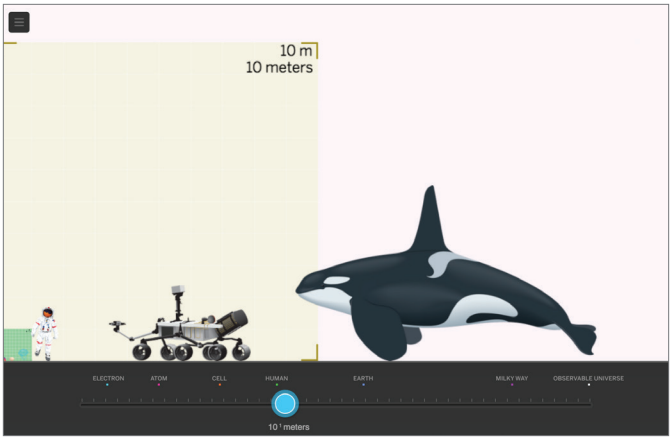
Metabolism: Engineering Internship

The RecipeTest Tool allows students to design and test FuturaBar recipes. As they use the tool, students consider how the amounts of carbohydrates and protein in the bars affect energy release as well as growth and repair. RecipeTest allows students to test their recipes on a variety of test users. These individuals have different needs in terms of energy and growth and repair. Through iterative testing using the RecipeTest Tool, students improve their FuturaBar designs.



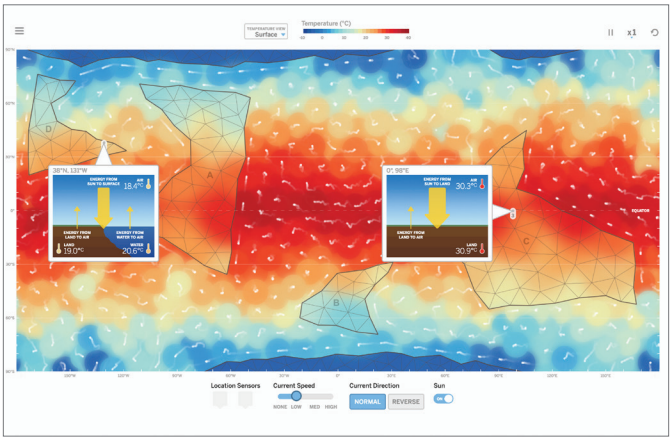
Microbiome

The Scale Tool is a digital model that allows students to explore and compare the relative sizes of different objects in order to develop a conceptual understanding of scale. The Scale Tool, and the activities in which it is used, address the crosscutting concept of Scale, Proportion, and Quantity, one of seven crosscutting concepts called out in the Next Generation Science Standards that bridge core ideas across disciplines in science and engineering.



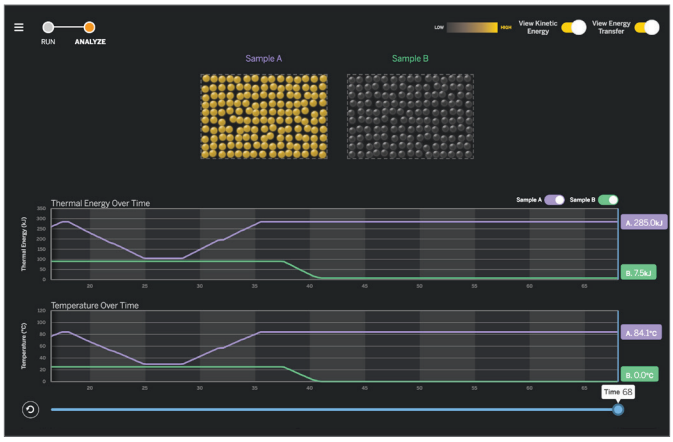
Ocean, Atmosphere, and Climate

The Ocean, Atmosphere, and Climate sim is an interactive computer model with four modes. Current Map mode allows students to investigate how currents travel around a planet and how they affect air temperature at different locations. Wind Map mode allows students to investigate how currents are affected by wind. Energy Test mode allows students to observe energy transfer between the surface and the air. Surface Test mode allows students to investigate how energy from the sun warms the air on the planet.



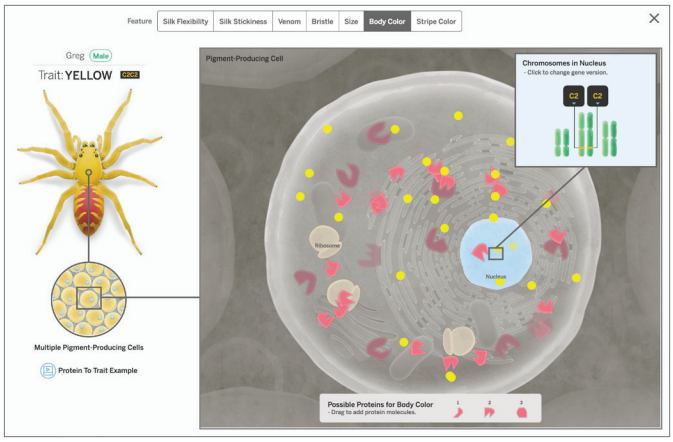
Thermal Energy

The Thermal Energy sim is an interactive model that allows students to investigate the concepts of temperature and thermal energy at the molecular level. The sim also enables students to observe energy transfer when samples at different temperatures are put into contact with one another. Students can transfer energy into and out of a sample in order to change the sample's temperature and its thermal energy.



Traits and Reproduction

The Traits and Reproduction sim is an interactive, scientific model that allows students to understand the factors that lead to variation among organisms and their offspring. The sim models how genes provide instructions for building proteins that lead to observable traits in organisms. It also shows how organisms inherit different traits from their parents through sexual reproduction. Students explore these concepts in the sim by investigating different features of model spiders. In the sim, students can select a specific spider to investigate and then change its traits. Students can also mate two spiders to observe the processes of creating and fertilizing reproductive cells, examining the traits and genes of spiders' offspring. Students are also able to mutate genes in reproductive cells and investigate the effect of mutations on the traits of offspring.



Weather Patterns

The Weather Patterns sim is an interactive, scientific model that allows students to understand the factors that lead to different weather outcomes with respect to the amount of rain. The sim models how air parcel temperature, the amount of water vapor in an air parcel, and the surrounding air temperature can produce different amounts of clouds and rain. The sim visualizes energy transfer and allows students to investigate the relationship between energy transfer and the severity of weather events.