

## **The Transformation of Energy and Matter in Ecosystems**

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One of the Crosscutting Concepts of the Next Generation Science Standards is “Energy and Matter: Flows, Cycles, and Conservation.” Yet even at the most basic level, students have a difficult time understanding the concept of energy, including the conservation of energy and energy conversions during cellular metabolism, specifically photosynthesis and cellular respiration. I have found that many students confuse matter and energy, even after being introduced to these concepts in earlier science classes. The goal of this unit is to solidify students’ understanding of matter, energy, and their transformations, while being able to apply these concepts to cellular metabolism (specifically photosynthesis and cellular respiration) and the conversions of matter and energy in ecosystems. It begins by exploring how energy is transferred through food webs in ecosystems and how matter is cycled between living and nonliving things. It then focuses on the transformations of matter and energy during the processes of photosynthesis and cellular respiration, using molecular models, calculating bond energies, and observing a demonstration – combustion of a gummy bear. Students then use a computer model as well as experimentation to investigate the effect of different factors on these chemical reactions.