THE STANDARD

Kinetic Energy

Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

DCI
DISCIPLINARY CORE IDEA

PS3.A · Definitions of Energy

> *Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.*

Anything moving has kinetic energy. Two things change how much: how heavy it is and how fast it's going. Heavier means more. Faster also means more, but speed has an outsized effect. Doubling the mass doubles the energy. Doubling the speed does a lot more than that. The relationship with mass is a straight line. **The relationship with speed bends upward.**

SEP
SCIENCE & ENGINEERING PRACTICE

Analyzing and Interpreting Data

> *Construct and interpret graphical displays of data to identify linear and nonlinear relationships.*

Students aren't reading about the relationship between mass, speed, and kinetic energy. They're collecting data, plotting it, and reading the relationship off the graph. Two graphs, two stories. One should come out as a straight line. One should curve. **The shape of the line is the answer.**

CCC
CROSSCUTTING CONCEPT

Scale, Proportion, and Quantity

> *Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.*

The standard runs on proportional thinking. If you double the mass, what happens to the energy? If you double the speed? The answers aren't the same, and that gap is the whole point. **Students compare magnitudes and notice when a quantity scales linearly versus when it scales faster than that.**