Research on Student Learning

Students' meaning for "energy" both before and after traditional instruction are considerably different from its scientific meaning. [1] In particular, students believe energy is associated only with humans or movement, is a fuel-like quantity which is used up, or is something that makes things happen and is expended in the process. Students rarely think energy is measurable and quantifiable. [2] Although students typically hold these meanings for energy at all ages, upper elementary-school students tend to associate energy only with living things, in particular with growing, fitness, exercise, and food. [3]

Middle- and high-school students tend to think that energy transformations involve only one form of energy at a time. [4] Although they develop some skill in identifying different forms of energy, in most cases their descriptions of energy change focus only on forms that have perceivable effects. [5] The transformation of motion to heat seems to be difficult for students to accept, especially in cases with no obvious temperature increase. [6] Finally, it may not be clear to students that some forms of energy, such as light, sound, and chemical energy, can be used to make things happen. [7] Some students of all ages have difficulty in identifying the sources of energy for plants and also for animals. [8] Students tend to confuse energy and other concepts such as food, force, and temperature. As a result, students may not appreciate the uniqueness and importance of energy conversion processes like respiration and photosynthesis. [9] Although specially designed instruction does help students correct their understanding about energy exchanges, some difficulties remain. [10] Careful coordination between The Physical Setting and The Living Environment benchmarks about conservation of matter and energy and the nature of energy may help alleviate these difficulties. [11]

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