

The Physical Setting > Atoms and Molecules

Research on Student Learning

Elementary - and middle - school students may think everything that exists is matter, including heat, light, and electricity.

[1] Alternatively, they may believe that matter does not include liquids and gases or that they are weightless materials. [2]

With specially designed instruction, some middle - school students can learn the scientific notion of matter. [3]

Middle-school and high-school students are deeply committed to a theory of continuous matter. [4] Although some students may think that substances can be divided up into small particles, they do not recognize the particles as building blocks, but as formed as basically continuous substances under certain conditions. [5]

Students at the end of elementary school and beginning of middle school may be at different points in their conceptualization of a "theory" of matter. [6] Although some 3rd graders may start seeing weight as a fundamental property of all matter, many students in 6th and 7th grade still appear to think of weight simply as "felt weight" -- something whose weight they can't feel is considered to have no weight at all. Accordingly, some students believe that if one keeps dividing a piece of styrofoam, one would soon obtain a piece that weighed nothing. [7]

Students of all ages show a wide range of beliefs about the nature and behavior of particles. They lack an appreciation of the very small size of particles; attribute macroscopic properties to particles; believe there must be something in the space between particles; have difficulty in appreciating the intrinsic motion of particles in solids, liquids and gases; and have problems in conceptualizing forces between particles. [8] Despite these difficulties, there is some evidence that carefully designed instruction carried out over a long period of time may help middle-school students develop correct ideas about particles. [9]

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