

The Living Environment > Flow of Matter in Ecosystems

Research on Student Learning

Students of all ages see food as substances (water, air, minerals, etc.) that organisms take directly in from their environment. ^[1] In addition, some students of all ages think food is a requirement for growth, rather than a source of matter for growth. They have little knowledge about food being transformed and made part of a growing organism's body. ^[2] Middle-school and high-school students have difficulty thinking of the human body as a chemical system and have little knowledge of the elements composing the living body. ^[3] In particular, middle-school students think organisms and materials in the environment are very different types of matter. Students see these substances as fundamentally different and not transformable into each other. ^[4]

Some students of all ages hold misconceptions about plant nutrition. ^[5] They think plants get their food from the environment rather than manufacturing it internally, and that food for plants is taken in from the outside. These misconceptions are particularly resistant to change. ^[6] Even after traditional instruction, students have difficulty accepting that plants make food from water and air, and that this is their only source of food. Understanding that the food made by plants is very different from other nutrients such as water or minerals is a prerequisite for understanding the distinction between plants as producers and animals as consumers. ^[7]

Some middle-school students do not realize that the matter from dead organisms is converted into other materials in the environment. Some middle-school students see decay as a gradual, inevitable consequence of time without need of decomposing agents. ^[8] Some high-school students believe that matter is conserved during decay, but do not know where it goes. ^[9]

Middle-school students seem to know that some kind of cyclical process takes place in ecosystems. ^[10] Some students see only chains of events and pay little attention to the matter involved in processes such as plant growth or animals eating plants. They think the processes involve creating and destroying matter rather than transforming it from one substance to another. Other students recognize one form of recycling through soil minerals but fail to incorporate water, oxygen, and carbon dioxide into matter cycles. Even after specially designed instruction, students cling to their misinterpretations.

Instruction that traces matter through the ecosystem as a basic pattern of thinking may help correct these difficulties. ^[11]

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