

3rd Grade Earth's Changes Unit Student Misconceptions

Students' Understanding of Controlled Experimentation (AAAS, 1993, p. 332)

Students of all ages may overlook the need to hold all but one variable constant, although elementary students already understand the notion of fair comparisons, a precursor to the idea of “controlled experiments” (Wollman, 1997; Wollman & Lawson, 1977).

The idea of “fair” experiments is particularly relevant in Lesson 6, which involves comparing the stream speed of a sloped stream and nearly level stream. The class experiment provides an opportunity to reinforce the concept of “fair” experiments with students.

Misconceptions about Processes that Shape the Earth (AAAS, 1993, p. 336)

Students of all ages may hold the view that the world was always as it is now, or that any changes that have occurred must have been sudden and comprehensive (Freyberg, 1985).

The Earth's Changes unit addresses several slow processes that have changed the surface of the earth. In Lessons 1 and 2 students examine evidence of weathering and simulate weathering using sugar cubes and water. Since the experiment illustrates weathering occurring quickly, teachers need to make sure misconceptions about change occurring quickly is not reinforced. Evidence, such as pictures of dated tombstones with varying degrees of weathering, challenges students' preconceptions about the speed of weathering. (Pictures are available on the electronic curriculum.) Lessons 5 and 6 address erosion and the resulting changes to rivers. “Where Has the Waterfall Gone” activity in Lesson 6 provides mathematical evidence of the extraordinarily slow, yet dramatic, changes occurring to Niagara Falls.

Students' Understanding and Use of Models (AAAS, 1993, p. 357)

Students may not accept the explanatory role of models if the model shares only its abstract form with the phenomenon, but will usually accept the explanatory role of models if many of the material features are also the same (Brown & Clement, 1989).

Since the unit utilizes physical models extensively, students should be able to relate the models to the real world and understand what the models illustrate. However, since models have limitations, sometimes students have difficulty accepting the explanatory role of the model because it isn't the “real” thing. During the unit, teachers need to deliberately relate the models to the real processes they represent.

Students' Misunderstandings of Terms (Uncovered during Pilot)

- Students used the term weathering liberally to mean any type of change. Once erosion was introduced, the students used (incorrectly) the terms interchangeably. (See pages 54 and 55 in BSCS Science T.R.A.C.S. *Investigating the Changing Earth* Teacher's Guide for additional information on weathering and erosion.) Throughout the unit the pilot teacher continually collected data about students progress in understanding the concept of weathering. Data included "quick writes" that required all students to explain the concept, class conversations about the process, and individual discussions with students about the meaning of weathering.
- During class discussions about weathering, students used the terms melting and dissolving as synonyms for weathering. Further conversations revealed that students did know the scientific meaning of melting. A mini-lesson was needed to correct the misuse of terms.

Source:

American Association for the Advancement of Science (1993). *Benchmarks for science literacy*. New York: Oxford University Press.