

## FEATURED PROJECT: BROWNFIELD ACTION

The hybrid CD-ROM/web-based simulation, Brownfield Action, combines scientific expertise, constructivist educational philosophy, and multimedia programming to advance the teaching of environmental science. Large introductory courses often present different aspects of their content in a fragmented manner through lectures, laboratory sessions, problem sets, tests, and discussions; in contrast, Brownfield Action challenges students with a scenario calling for the integration and application of the full range of skills involved in an environmental site investigation. Used as a central component of an undergraduate course since 1999, and subjected to rigorous evaluation and upgrading throughout its development, this program has markedly improved the depth and coherence of students' understanding of the course material. Brownfield Action enacts the principle at the core of contemporary thinking about the teaching and learning process: that knowledge is not transmitted from a single source, but constructed by the learner from the available evidence and the relevant discourses.

Through maps, documents, videos, simulated geological testing technologies, and an extensive three-dimensional data set, Brownfield Action models the physical evidence and historical background of a suspected local contamination event. Students assume the role of environmental consulting firms contracting with a real estate developer to accumulate evidence about the condition of a parcel of land and report on the feasibility of commercial construction. Each firm works with a fixed budget to deploy a battery of investigative resources, reconstruct a detailed narrative, and confirm or disconfirm hypotheses through physical tests. Like real-world environmental consultants, users of Brownfield Action must develop and apply expertise from a wide range of fields, including not only environmental science and engineering but journalism, medicine, public health, law, civics, economics, and business management. Students thus gain an unprecedented appreciation of the complexity, ambiguity, and risk involved in environmental crises.

While many simulators present aspects of reality through mathematical models that allow users to manipulate variables and study input/output relationships, Brownfield Action is a true simulation: it presents a narrative, a battery of resources, a problem to solve, and a set of coherent roles through which students develop that solution. At the end of a semester working with Brownfield Action, students have transformed two-dimensional clues into a rich three-dimensional model and a reconstruction of the presence, extent, causes, and consequences of environmental damage.

