

Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01348, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01348
EGU General Assembly 2008
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Earth science instruction using brownfields in the virtual classroom

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Geophysical methods of defining contaminant plumes from brownfields are taught in lecture and laboratory using *Brownfield Action* (BA) that is a network-based, interactive, digital space and simulation in which undergraduate students explore and solve problems in geohydrology. In the U.S., BA is recognized nationally as an innovative curriculum and simulation that has been developed by Peter Bower at Barnard College in collaboration with Columbia University's Center for New Media Teaching and Learning. Brownfields are former industrial sites that have potential as recreational, residential, and commercial real estate sites when reclaimed. As part of assessing the value of such a site, an environmental site assessment (ESA) is required to determine the nature and extent of any contamination. To reach that objective, BA contains a narrative element that is embedded and to be discovered in simulation; it is a story of groundwater contamination complete with underground contaminant plumes in a fictitious town with buildings, roads, wells, water tower, homes, and businesses as well as a municipal government with relevant historical documents. Student companies work collaboratively in teams of two, sign a contract with a development corporation to conduct a Phase One ESA, receive a realistic budget, and compete with other teams to fulfill the contract while maximizing profit. To reach a valid conclusion in the form of a professional-level ESA and 3-D maps of the physical site, teams must construct a detailed narrative from diverse forms of information, including socio-historical and a scientific dataset comprised of over 2,000,000 data points. BA forces the students to act on their perceptions of the interlocking realms of knowledge, theory and practical experience, providing an opportunity for them to gain valuable practice at tackling the

complexity and ambiguity of a large-scale, interdisciplinary investigation of ground-water contamination and environmental forensics.