

## **Beyond Traditional Professional Development Courses: The Earth System Science Online Course**

**James Botti**

The developers of this course believe that the best way for teachers to effortlessly acquire the skills needed to implement a problem-based classroom is to let them experience such a classroom themselves—from the student’s point of view. Teachers participating in this course work in collaborative groups to tackle problems and information that are completely new to them. And, they observe exactly how a mentor (an online earth systems scientist) facilitates learning in this student-centered model.

Teachers look at the earth as a system made up of four interdependent, solar-driven, dynamic subsystems: the lithosphere, atmosphere, hydrosphere, and biosphere. A close examination of how these subsystems interact reveals states and processes such as dynamic equilibrium, critical thresholds, positive and negative feedback loops, feedback delays, and inertia. Teachers are presented with global scenarios, or “events,” such as a hurricane and asked to predict how the event will variously impact the four subsystems. They must base their predictions on careful observation and data collection and on the premises of earth science. The notions of “right” or “wrong” predictions are discouraged. Online teams of teachers collaborate in predicting the systemic impacts of specific environmental events.

Teachers who have taken this course report that problem-based learning turned out to be more difficult and more work than they thought it would. They note that their unfamiliarity with the course content magnified the challenges, ambiguities, and uncertainties they encountered and so made the experience more similar to what they presumed would be the actual experience of scientists and to the actual experiences their students would have.